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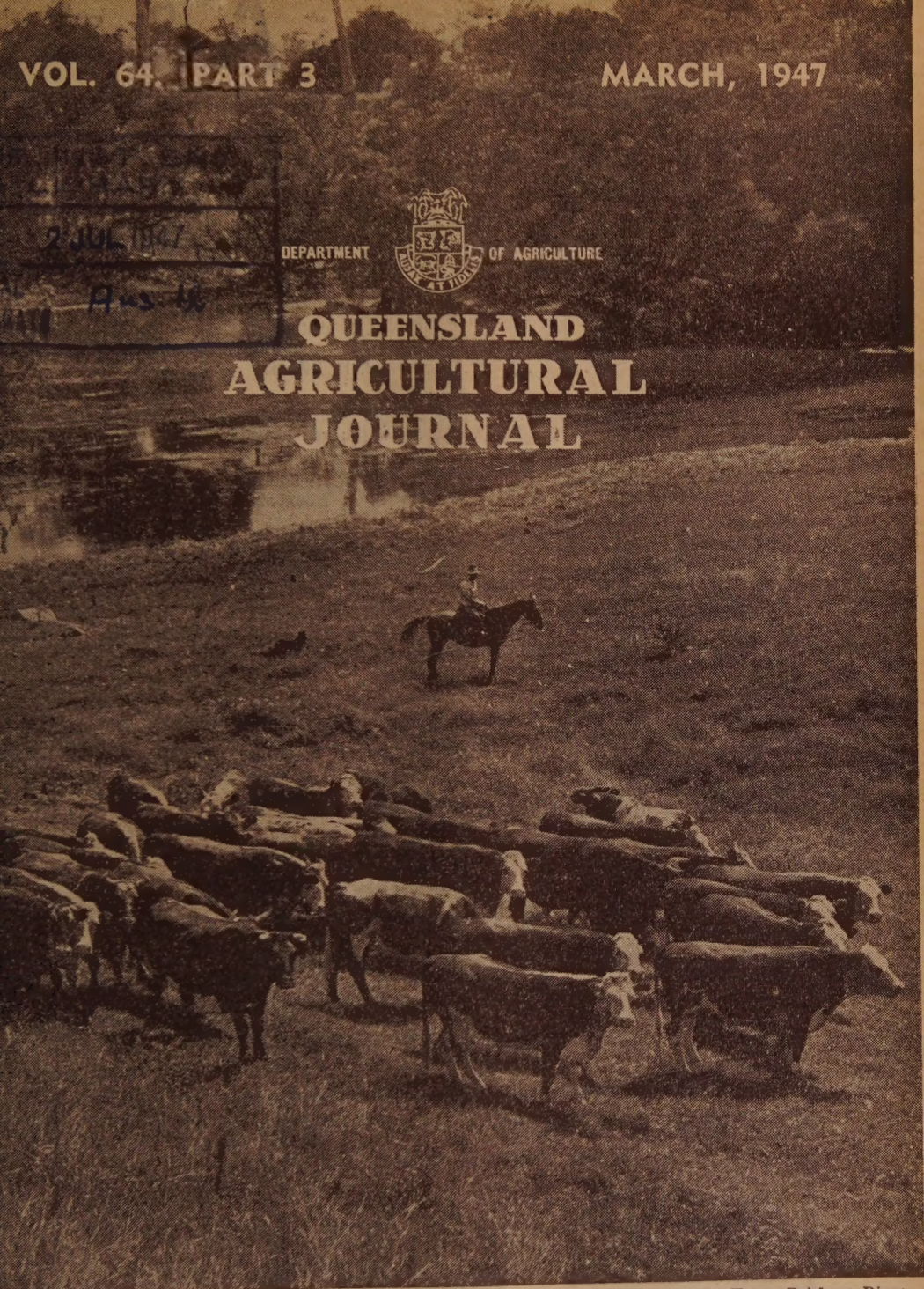
QUEENSLAND AGRICULTURAL JOURNAL



On Upper Brisbane River.

LEADING FEATURES

Investigation of Horticultural and other Problems

Problems of Settlement on the Northern Tablelands

Plants Poisonous to Sheep

Locust Outbreaks in South Queensland

The Cooling of Milk on the Farm

Are Heavier Pigs More Profitable than Light?

Cattle Lice

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Volume 64 Part 3

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
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Event and Comment.

Investigation of Horticultural and other Problems.

IN order to carry out field investigation of horticultural problems in South Queensland, the Department of Agriculture and Stock has acquired a property of 113 acres situated about three miles from Nambour. The location has been chosen with care, and it has the great advantage that within this small area are soils typical of district soils on which pineapples, bananas and citrus fruits are successfully grown; a small area of creek-flat soil also is available.

The new horticultural experiment station is as yet, naturally, in the very early stages of development, but already some valuable and interesting work has been initiated, the results of which will have a direct beneficial bearing on the future of fruit and vegetable culture in the south-eastern districts of the State.

After some years of careful study of undesirable inherited qualities in pineapple plants, there has now been planted at the station some 2½ acres of "pedigree" pineapples. As these are multiplied (and continually re-selected) it is intended that they shall form the basis for a complete changeover to plantings of pedigreed stock throughout the State. Undesirable characteristics which have been minimized or eliminated in this pedigree material includes excessive slip-growths and badly shaped or malformed fruit.

Fortunately, a small area of the new station has been under pineapples for a number of years, and this has provided the opportunity for studies of the best methods of "bringing back" pineapple lands. Different methods of cultivation, fertilization and rotation to leguminous crops are now being tested.

A point of great interest is that the system of planting with contour drains every chain protected the field from erosion during the recent flood rains. Although successive downpours were very heavy there was vitually no loss of soil from the contour-ploughed ground. Farmers on the near North Coast and in other parts of Queensland are naturally interested in how contour ploughing as a means of protecting soils from the washing of torrential rains works out in practice.

A lead also is being given to the young ginger industry by an experiment which is determining the relationship between time of harvesting and yield of crop and its effect on the fibre and taste of the finished product. A tough, hot, fibrous preserved ginger is naturally not attractive to buyers and users and reliable information on the fluctuation of these characteristics with period of growth is obviously important.

Stocks of citrus fruits and avocados for transplanting to fields now in course of preparation are being established. Breeding, improvement of quality, cultural practices and disease- and pest-control will all be studied. Pedigreed stocks will be developed for supply of commercial plantings.

Much work with papaws and bananas has already been done in the district by departmental officers, and some promising types are being developed. This work will be transferred to the new station as soon as the land is ready.

During the war the Maroochy district became an important vegetable-producing area, and these crops also will receive attention.

The Department has acquired another property at Redland Bay on which research work on the problems of vegetable production will likewise be initiated this year. It is proposed, too, to test out the possibilities of crops new to Queensland, and a preliminary planting of the Indian fibre "ramie" has been made. An extensive testing of all available leguminous manure crops also is included in the experiment projects already planned for initiation at Redland Bay.

The establishment of these new experiment stations is part of the general plan for amplifying and intensifying the research work of the Department of Agriculture and Stock for the benefit of the primary industries of Queensland.

Problems of Settlement on the Northern Tablelands.

W. R. STRAUGHAN, Senior Adviser in Agriculture.

MANY people are giving serious consideration to land settlement at present. This is readily explained by the widely publicised world shortage of food supplies and by the interest in land pursuits shown by discharged servicemen. Therefore, it is believed that some notes on the problems confronting intending settlers in one of our northern districts will be of general interest.

Rainfall.

On the Northern Tablelands, as in the other parts of this State, approximately three-quarters of the annual rainfall occurs during the summer months. There is a fairly big variation in the rainfall for different localities, and these latter are somewhat sharply defined.

Storm rains commence in December—occasionally in November—and are a prelude to the set-in conditions extending through the latter half of December and during January, February, March, and occasionally April. Sometimes, however, the commencement of this period of wet weather is delayed until late January, or even early February. Following the "wet season" the rainfall gradually tapers off until October, when the storms, the prelude to the wet season, commence again.

The average annual rainfalls for the principal recording centres on the Tablelands vary from 35 inches at Mareeba to nearly 150 inches at Topaz, east of Peeramon.

The normal dairying districts are confined to that section of the Tableland where the rainfall is in excess of 50 inches per annum. Drier areas are considered unsafe for dairying and are devoted to other forms of rural undertaking such as cattle raising, and at Mareeba and Dimbulah, tobacco growing.

The 50-inch rainfall belt also encompasses the rain forest area as distinct from the open forest country in the lower rainfall belt.

Soils.

The red volcanic (basaltic) loams which so characterise the Tablelands proper also almost wholly coincide with the higher rainfall areas and, since they are far more fertile than the soils derived from schists and

granites, and which are associated with the lighter rainfall and open forest country, their limitations prescribe a natural boundary beyond which dairying does not appear and cannot be expected to thrive.

Towards the 70-inch and in successively higher rainfall belts, the heavier precipitations have leached the soil, leaving it with an acid reaction which is unfavourable for crop production. Consequently, while the Atherton, Tolga, and Kairi areas are eminently suited for maize-growing and other forms of crop production, soils toward Millaa Millaa and Peeramon are generally unsuitable for cultivation, and towards Palmerston appear to be even unsuited for the growth of some popular varieties of grass.

The topography of the country, which is gently undulating around Atherton, Tolga, and Kairi, becomes progressively more steeply undulating and later hilly toward the southern and western perimeters.

Thus the topography of the area also influences the boundaries of the varying Tableland activities, since the gentler slopes around Atherton are suited for cultivation, whilst the steeper gradients to the south and west are neither convenient for ploughing nor safe from erosion, should the grass cover be destroyed.

Since the catchment area, type of soil, and method of cultivation practised all influence erosion, it would be difficult to arbitrarily fix the degree of slope which land in cultivation could stand, but generally land under summer cultivation with a slope of more than 6 per cent. would need protection.

Grassland for grazing would be too steep when it approached the order of 25 per cent., as such slopes will not carry pasture for more than a few years without serious depletion even under the lightest stocking. Production of dairy cattle grazing on such slopes would be impaired as a result of the arduous conditions under which they were forced to feed.

Pastures.

The dominant pasture grasses are paspalum around Malanda and Kikuyu grass in the Millaa Millaa district. The Millaa Millaa area was originally sown with paspalum but was later over-planted with Kikuyu grass, which has now outgrown the original paspalum sward.

Kikuyu grass generally provides a larger volume of feed per acre during the year, is more vigorous in controlling foreign growths and withstands drier conditions better than paspalum. The present limitations of the area under Kikuyu grass are apparently purely artificial. Plantings in Millaa Millaa have been more extensive than elsewhere. It thrives quite well in the Malanda and other areas, but plantings have been limited. It has to be propagated by cuttings and this fact restricts its rapid establishment.

Molasses grass is frequently sown in new scrub burns and in cultivations being returned to grass, and it gives quite satisfactory results if grazing is intelligently controlled. Attempts to establish other grasses and legumes have not so far been entirely successful.

In the less acid soils around Atherton, Rhodes grass is most successful.

Para grass has been successfully established in small areas and provides useful grazing. The climate, however, is generally regarded as being too cool for its best development.

Clovers are in evidence on occasions when spring rains are favourable, but generally suitable rains are not sufficiently frequent to establish this legume in any prominence in Tableland pastures.

Guinea grass, particularly the purple-topped variety, could be advantageously employed as a pasture grass, but so far has not gained favour.

Further grasses and legumes are being continually introduced with a view to augmenting those at present established.

Maintenance of Pastures.

Nearly all soils which are cleared of tropical rain forest quickly lose their original productivity as a result of the leaching effect of high rainfall. They are thus unable to continually support grasses such as paspalum, which demand conditions of high fertility. Inferior types of grasses such as carpet grass, on the other hand, can survive and even grow vigorously in somewhat impoverished soils. Consequently, as the fertility depreciates, paspalum is dominated and replaced by the inferior species.

The general practice of leaving the farm in a few large paddocks instead of subdividing it more thoroughly allows selective grazing by stock. Thus sections of the farm are overgrazed to the detriment of paspalum and other useful grasses which are constantly eaten in preference to the inferior types. The latter remain unchecked and so dominate the more heavily grazed species.

Failure to spread animal droppings reduces the area available for grazing, thus forcing stock to overgraze the non-contaminated pasture.

On flat and slightly undulating country, cultivation of the areas infested with inferior pasture plants can be successfully undertaken and the area resown to pastures. Such a practice on steep gradients is either not possible or inadvisable. In such circumstances, the only remedial measures are linked with prevention—that is, controlled stocking by subdivision whereby rotational grazing can be practised and areas alternately spelled before they become overgrazed.

Carrying Capacity of Pastures.

The average number of stock to the acre of sown or planted pastures on established dairy farms is usually greater than one beast to 3 acres. The intrusion of inferior grasses, particularly carpet grass and blady grass, and also the heavy infestation by wild tobacco and bracken in certain localities, clearly indicate that such a stocking rate is excessive.

On farms where the slopes are not excessive and where stock numbers have been kept below the average figure, pastures generally remain free of such intrusions as the above. It would thus appear that any grazing in excess of one beast to 4 acres will lead to soil improvement and decline of pastures, particularly where there is no provision for the control of grazing.

Establishment of Pastures.

The first essential in establishing pasture is to fall the standing timber. Falling of heavy rain forest (scrub) on the Tablelands costs, by contract work, from £5 to £6 per acre. Burning is usually done by the owner at some appropriate time when the timber is sufficiently dry to burn and weather conditions are favourable for a good fire.

Owing to the high proportion of relatively large timber, good burns are seldom observed; thus provision must be made for a further firing during the following dry season. In such cases the area is generally sown to molasses grass alone or in admixture with other grasses. The molasses grass will carry a fire during the dry weather preceding the next wet season, and while it may be severely checked by the fire, the admixture of the other grass or grasses subsists as an established pasture. Where the original sowing is pure molasses grass, however, the area will probably have to be resown to a suitable grass after the second firing.

Grass seed is usually sown by hand, the speed of sowing being approximately 2 man-hours per acre. The cost of seeding varies with the variety of grass sown, the rate of sowing, and the cost of seed.

Rates of sowing are usually as under:—

Paspalum—2 to 4 lb. per acre (2 lb. in a mixture).

Molasses grass—2 lb. per acre (1 lb. in a mixture).

Guinea grass—2 to 3 lb. per acre (½ lb. in a mixture).

Rhodes grass—3 to 4 lb. per acre (2 lb. to 3 lb. in a mixture).

Kikuyu grass is propagated by cuttings and is usually planted at opportune periods after seeding with other grasses. The cost of establishment is extremely variable, but sufficient cuttings to eventually establish the grass when it is planted on an area already under grass to some other species is not excessive and should require about 3 to 4 man-hours per acre.

Providing the remaining logs and stumps are not sufficient to endanger stock grazing on the area, the pasture may be used during the first year, but this may delay ultimate establishment of a clean pasture. This delay would not be detrimental provided the cover was not sufficiently depleted to allow foreign growths to gain access to the pasture. If, however, it is desired to graze a freshly established pasture in its first season, it will be desirable to materially increase the rate of sowing.

Cultivation.

Outside the maize areas on the Atherton and Evelyn Tablelands, cultivation is confined to fodder crops such as cow cane as a feed reserve and maize or sorghum for silage. The growing of hay crops is not generally practised, since weather conditions are not favourable for curing. In the maize-growing areas, lucerne and winter cereals are produced for hay and grazing.

It is essential that sufficient bulk feed be produced and conserved on the farm to meet the needs of the stock for at least four months of each year. For a herd of forty milking cows, this would require a minimum of 100 tons of maize silage or its equivalent. Normally such a quantity of feed could be obtained from an area of 10 to 12 acres of cultivation. Therefore provision should be made for the cultivation annually of at least 10 to 12 acres of land not subject to erosion.

Cash Crops.

The production of cash crops such as maize, peanuts, cowpea, lucerne, potatoes, and vegetables is virtually confined to the area adjacent to Atherton, Tolga, and the Barron River.

The disadvantages of general cultivation in what are now regarded as the dairying areas are sufficient to discourage any attempts at the production of cash crops. The soils are generally unsuitable for cropping, being too acid in reaction and often not sufficiently fertile. The land is generally too steep for cultivation. The local markets for nearly all truck crops are already well provided for from more favoured areas.

Dairying.

The dairying industry has been established for many years on the Tablelands, but received its greatest impetus following World War I. It is now estimated that dairy farms cover approximately 173,000 acres, mainly in the Shires of Eacham and Herberton, and is the most important local industry. Production is maintained almost entirely from pastures. No system of rotational grazing nor pasture management has been practised, despite the fact that all pastures have had to be artificially established with introduced grasses.

Until recently, butter production was almost the only source of income, but with the introduction of milk pasteurization plants, milk production is now nearly as valuable as butter production. Pig raising has been carried on in a most casual manner and has declined as a result of the increasing popularity of milk production.

The average dairy herd comprises approximately forty mature cows with a very limited number of younger stock for replacements. The usual size of developed properties is about 120 to 160 acres, but varies from as low as 80 acres to over 600 acres in certain instances. The average return per cow is between 173 and 204 lb. of commercial butter fat per year, which at present values gives a monetary return of between £14 and £16 per cow per annum, but better managed properties produce £18 to £20 per cow per annum.

Dairying Districts.

Julatten.

These lands are generally within the belt of the 50-inch rainfall and many of them are rain forest areas, but the fertility even in these is not high. The soils may be generally described as varying from white clays to red loams, the dominant soil being the intermediate yellow clay loam. The rain forest is not dense. Forest soils are very shallow, white clays. Timbers are mainly tea-tree, bloodwood, and popular gum. The fertility of the forest areas is extremely low.

Pastures are generally of paspalum with small patches of Para grass on the creek banks and flats. Molasses, Rhodes, and possibly Guinea grasses would be useful additions. Water is plentiful and well distributed. The small butter factory which was established there some years previously is now closed as the result of insufficiency of supplies.

Malanda.

Soils in the Malanda area are typical red loams of fair fertility and capable of carrying a good body of grass, but becoming too acid and frequently too steep for cultivation.

The carrying capacity of these soils would normally be a beast to 4 acres, excepting where the fertility falls off on some outcrops of shallower and stiffer clay loams, and on the steeper slopes, where the carrying capacity falls to 5 acres per beast. Normally this country can be regarded as suitable for settlement providing the acreage is adequate.

Pastures are dominantly paspalum, though it may be desirable to increase the acreage under Kikuyu, molasses, and, in same areas, Rhodes and Guinea grasses. Cultivation is uusally limited to that section of the district immediately around Malanda and to the north of that centre. Good supplies of water are plentiful. The Malanda Dairy Factory manufactures butter and pasteurizes milk.

Millaa Millaa.

The red loam soils in this area are probably slightly less fertile than those of Malanda, and are consistently acid in reaction and often too steep for cultivation. However, there is a higher rainfall throughout the area and the district's carrying capacity is generally higher than at Malanda, being usually a beast to 4 acres, and in certain favoured but isolated instances as high as one beast to 3 acres.

Areas suitable for cultivation are extremely limited and dairymen are wholly dependent upon pastures for their stock. Pastures are dominantly Kikuyu grass, and on the steep slopes overstocking and soil impoverishment have caused depreciation of the grass. Improvement is unlikely unless a suitable vigorous summer-growing legume can be discovered for the area.

Ravenshoe and Evelyn.

As these districts are situated on a higher elevation the growing season for pasture is somewhat shorter than at Malanda and Millaa Millaa, but soil conditions are similar. There are, however, more extensive areas suitable for cultivation. A fairly extensive belt of shallow soil with a yellow subsoil passes through the district, and large sections of this soil are now carrying bracken fern. Fodder crops and some cash crops have been successfully produced in the area. Water is in adequate supply on the farms. There is a butter factory at Ravenshoe.

Plate 40.

POWER ALCOHOL DISTILLERY, SARINA, MACKAY DISTRICT, QUEENSLAND.

APPLIED BOTANY

Plants Poisonous to Sheep.

S. L. EVERIST, Assistant Botanist.

(*Continued from February, 1947, page 95.*)

Darling Pea.

Other Common Name: Red Darling pea.

Botanical Name: *Swainsona galegifolia* R. Br.

Description: Erect herb up to 18 in. high; leaves fern-like, up to 3 in. long, individual leaflets ¼-¾ in. long, notched at the tip; flowers about ¾ in. long, pea-shaped, showy, varying in colour from purple to deep red, scattered on the long, erect flower stalk which exceeds in height the remainder of the plant; pods balloon-like, about 1 in. long and ½ in. broad, tapered at both ends, dropping on the stalk. (See Plate 41.)

Distribution: In Queensland, this plant is common on the Darling Downs and on heavy soils as far west as about Augathella. It is also found in scattered localities in the coastal districts.

Seasonal Occurrence: Darling pea come up in late winter and spring and most trouble with it occurs during the months of September, October and November.

Evidence of Poisoning:

(*a*) Field: For more than 50 years the plant has been regarded as poisonous, animals affected showing peculiar symptoms and being referred to as "pea struck." Animals so affected develop a morbid appetite for the plant and will eat nothing else when they can get the pea.

(*b*) Feeding tests: As early as 1897, the plant was fed to sheep and produced symptoms identical with those observed in the field.* In sheep two to three years old, symptoms appeared three to four weeks after they began to eat the plant. When hand fed, some of the experimental animals survived for four months, but they were hopelessly crazed. After four to six weeks feeding on the plant and before symptoms were fully established, sheep returned to normal feed recovered completely. Once paralytic symptoms were established, return to normal feed did not bring about recovery, though the animals got no worse.

(*c*) Chemical: Negative qualitative tests for alkaloids and prussic acid on material from Mt. Tamborine have been reported.†

Symptoms: The symptoms have been described* as stupidity, loss of alertness and an agonised expression, followed by stiffness and slight staggering and frequent trembling of the head or limbs. Later, clumsiness and unsteadiness ensue and these slowly advance until the

* Martin, C. J.: *Agric. Gaz. N.S.W.*, Vol. 8, pp. 363-369, 1897.

† Hines, H. J. G.: Personal communication.

Plate 41.
DARLING PEA.—Dried specimen.

animals often fall down. In this stage, the action of an animal in running over small obstacles is characteristic. It jumps over a twig as if it were a foot high. When first it commences to tumble, it is able to regain its feet, but in the advanced stage of the disease this is impossible. After exhausting itself, it remains lying down until it dies. The sheep becomes progressively more bloodless and the blood contains fewer red cells. All symptoms are much exaggerated by driving. The teeth (especially in young sheep) frequently become loose and consequently displaced or even dislodged.

Post Mortem: There are no obvious changes except emaciation.

Prevention: Generally, sheep may be left on Darling pea for up to four weeks. During that time it will afford a fair amount of nourishment without causing permanent injury. After that time, any "pea-eaters" should be removed to pasture free from Darling pea.

Dwarf Darling Pea.

Common Name: No distinctive common name has been reported for this plant. The name above has been coined to indicate the habit of growth of the plant.

Botanical Name: *Swainsona luteola* F. Muell.

Description: Twiggy, much-branched herb; branches at first flat on the ground, turning upwards towards their ends; leaves, fern-like, 2-3 inches long, individual leaflets oval, $\frac{1}{4}$-$\frac{3}{4}$ inch long; flower stalks shorter than or as long as the leaves; flowers small, blue when fresh, set close together on the stalk; pods narrow, sloping obliquely upwards, fairly thick in texture, becoming hard and brittle when ripe, with a well-marked groove along the upper side. (See Plate 42.)

Distribution: In Queensland dwarf Darling pea is found mainly in the Springsure and Clermont districts and on patches of downs country between Roma and Augathella. It grows chiefly on black or chocolate soils.

Seasonal Occurrence: The plant comes up in late winter and spring.

Evidence of Poisoning:

(*a*) Field: In Queensland, the plant has been suspected on several occasions and several cases are recorded from New South Wales. In a case from near Augathella, sheep died over a period of about a week. Some badly affected animals did not recover, but those slightly affected appeared to get well.

(*b*) Feeding tests: In New South Wales the plant was proved to be poisonous if fed over a long period. With the high rate of consumption of 9 lb. per sheep per day, 41 days elapsed before symptoms appeared.* In another test sheep consumed $2\frac{1}{2}$ lb. each per day and symptoms developed after 51 days' feeding.† At Yeerongpilly, sheep fed 1 lb. each per day for 28 days were showing no effects when the test had to be discontinued because of shortage of material.

---

* Cleland, J. B., and McDonald, A. H. E.: *Agric. Gaz. N.S.W.*, Vol. 28, pp. 735-739, 1917.

† King, R. (1933): quoted by Hurst, E. "The Poison Plants of New South Wales" p. 192, 1942.

(*c*) Chemical: A moderate qualitative test for alkaloid in dried material has been reported.‡

Symptoms: The symptoms have been described§ as loss of sense of direction and muscular co-ordination, shivering, and walking with a proppy gait. After falling over, affected animals stiffen out and continue shivering until death, which occurs soon after falling down or up to 24 hours later. Some badly affected sheep hold their heads high, are stiff in both front and hind legs, the respiration is fast and heart fast and weak and the eyes glassy.

Plate 42.
DWARF DARLING PEA.—Dried specimen of complete plant.

Post Mortem: On post mortem, sheep in New South Wales§ showed emaciation, some clear colourless peritoneal and pleural fluid and slight congestion of the spinal cord and brain. No noticeable abnormalities were present in the Queensland sheep examined.

Prevention: The same methods apply to dwarf Darling pea as to Darling pea.

Thorn Apple.

Other Common Names: Native thorn apple, castor oil plant.

Botanical Name: *Datura Leichhardtii* F. Muell.

Description: Erect annual herb up to 18 inches high, with a strong, nauseating smell; stems smooth, thick, repeatedly forked; leaves, soft, smooth, very dark green, slightly toothed, 3-5 inches long, including the stalk, 1-2½ inches wide; flowers, white, funnel-shaped, 2-2½ inches

‡ Webb, L. J.: personal communication.

§ Swinburne, C. J.: unpublished report, Department of Agriculture and Stock files, 1939.

long; fruits about 1 inch in diameter, covered with stiff (not sharp) prickles, drooping when ripe, the enlarged calyx forming a cup; seed black. (See Plate 43.)

Distribution: In Queensland, the plant is found mostly on down country, especially in the Peak Downs area and in the central-west and north-west. It grows best on rich black or dark-grey clay soils and often favours well-worn stock routes, sheep-yards, and homestead gardens.

Plate 43.
Thorn Apple.—Mature plant, Westbourne.

Seasonal Occurrence: Thorn apple comes up after spring or summer rains. It is killed by frost.

Evidence of Poisoning:

(*a*) Field: Several cases are on record where this plant has been suspected of poisoning sheep, though other reports state that the plant is sometimes eaten without ill-effect.

(*b*) Feeding tests: Sheep fed with this plant at Yeerongpilly showed no ill-effects. One sheep consumed 6 lb. over a period of 7 days, and another ate 1lb. 7 oz. during 4 days. At Longreach a sheep was fed on the plant for 4 days without effect.

(*c*) Chemical: Thorn apple has been reported to contain alkaloids, the chief of which is scopolamine.

Symptoms: The following symptoms were noted in the case of suspected poisoning by this plant at Clermont:—"Affected animals usually drop to the ground in a sort of rigid spasm or convulsion and die almost immediately. They froth slightly at the mouth and the lips, tongue, and gums become blue after death."

Post Mortem: No post-mortem examination has been reported.

Prevention: If yards are heavily infested with thorn apple it is advisable to chip and burn the weed before sheep are crowded into the confined space. On stock routes there is little danger. Even hungry travelling sheep avoid it, and when it is plentiful other feed is usually available.

Wild Tobaccos.

Common Name: There are several kinds of wild tobacco in Western Queensland, but all of them are known by the same common name.

Botanical Name: *Nicotiana* spp. All species of Nicotiana native to Queensland were formerly known as *Nicotiana suaveolens* Lehm. At least five different species are now known to occur in Western Queensland, though true *N. suaveolens* has not been found there. Most cases of poisoning by these plants have been recorded under the name *N. suaveolens* and it is not possible to say which species was responsible.

Description: Annual herbs with rosette of leaves at the base; flowering stalks erect, usually bearing scattered leaves, smaller than those at the base; flowers white, narrow funnel-shaped, tube differing in length in different species, seed "pods" thin and dry, breaking and releasing great numbers of small seeds. (See Plate 44.)

Distribution: Wild tobaccos are common throughout the western districts, usually on sandy or loamy soils.

Seasonal Occurrence: The plants come up after spring and summer rains and die off in the winter.

Evidence of Poisoning:

(*a*) Field: Deaths in both sheep and cattle have been ascribed to eating these plants.

(*b*) Feeding tests: In New South Wales, 12 oz. or more of air-dried leaves were found to kill sheep rapidly.* Repeated small doses of less than 12 oz. had no effect. Apparently, no tests have been made with the Queensland plants.

(*c*) *Chemical*: All species contain one or more of the three alkaloids, nicotine, nor-nicotine and anabasine.

Symptoms: In sheep, symptoms are reported to be inco-ordination of movement, disturbance of eyesight and emaciation. In cattle, the following symptoms are reported†:—"Inability to travel, inco-ordination of gait, proppy in forequarters and lagging behind, trembling of muscles with tendency to walk backwards when made to rise, paddling

* Seddon, H. R., and McGrath, T. T.: New South Wales Dept. Agric. Veterinary Research Report No. 6, 119-121, 1933.

†Moule, G. R.: Unpublished report, Queensland Dept. Agric. and Stock files, 1942.

[*S. T. Blake, photo.*

Plate 44.
Wild Tobacco.—Mature plants.

movements when down. Death is either rapid or dragged out up to 5 days. In some cases there was respiratory embarrassment with nasal discharge. There was difference of opinion as to ocular disturbance."

Post Mortem: Post mortem of sheep* has revealed marked congestion of the fourth stomach and bowel, especially the small intestine. In one sheep, general suffusion of the lungs, congestion of the kidneys and liver, empty bladder and pale heart muscle were also noted.

Prevention: Most animals avoid these plants when other feed is available. Hungry mobs of travelling sheep should not be allowed to eat these plants. Since they grow in patches, it is usually possible to shepherd the mob past them.

Plate 45.

CAUSTIC CREEPER.—Mature plant viewed from above, Blackall.

Caustic Creeper.

Other Common Names: Milkweed, creeping caustic, balsam.

Botanical Name: *Euphorbia Drummondii* Boiss.

Description: Prostrate herb, all parts with milky sap; stems, leaf-stalks and fruits sometimes dull, dark red, sometimes dull green; leaves

* Seddon, H. R., and McGrath, T. T.; New South Wales Dept. Agric. Vet. Res. Rept. No. 6, 119-121, 1933.

opposite, smooth, ½-¾ inch long and half as wide; flowers small and inconspicuous; fruit about 1/10 inch across, rounded, with three vertical ridges, quite free from hairs. (See Plates 45 and 46.)

Distribution: Caustic creeper is a common weed in almost all parts of the State but is especially abundant on the heavy soils of the interior.

Seasonal Occurrence: The plant grows at any time of the year but most profusely after summer rains.

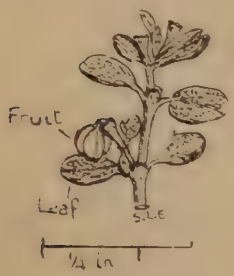


Plate 46.
CAUSTIC CREEPER.—End of stem with leaves and fruit.

Evidence of Poisoning:

(*a*) Field: Many Queensland graziers and drovers are emphatic that caustic creeper is poisonous to travelling sheep but safe for paddock sheep. All agree about the symptoms, which differ from those observed in other States.

(*b*) Feeding tests: In Queensland, feeding tests with sheep and rats gave no result. The amount of material used was small and further tests are needed. Feeding tests in New South Wales gave variable results. In Western Australia, tests with rats gave positive results.

(*c*) Chemical: Plants from some localities have been found to yield prussic acid, but the majority of tests for this substance have been negative. The symptoms observed in Queensland are certainly not those of prussic-acid poisoning.

Symptoms: In all Queensland cases, affected sheep swelled round the head and neck. If the swelling is pierced, a dark amber-coloured fluid exudes and the sheep often recovers. If no action is taken the sheep usually dies. Similar swellings were observed in rats fed experimentally in Western Australia.

Post Mortem: No post-mortem observations have been reported.

Prevention: Paddock sheep appear to eat this plant without ill effect, but care should be taken in moving hungry sheep over stock routes carrying much of this weed.

Treatment: Piercing of the swelling is said to bring about recovery of affected sheep.

Bottle-tree Caustic.

Other Common Names: Desert spurge, caustic plant.

Botanical Name: *Euphorbia eremophlia* A. Cunn.

Description: Erect herb up to 2 ft. high; lower part of stem unbranched, smooth, pale green, often slightly swollen and resembling a miniature bottle-tree in appearance; leaves sparse, pale green, 1-1¾ in. long, narrow; flowers inconspicuous; fruits smooth, 3-celled. (See Plates 47 and 48.)

Distribution: In Queensland, two forms are included under this name. One is a common weed of the sea-coast, the other grows chiefly in western localities. The western plant is widespread and grows on a variety of soils, but mostly on red, brown, or grey loams and clays.

Plate 47.
BOTTLE-TREE CAUSTIC.—Mature plant, Emerald.

Seasonal Occurrence: The western plant comes up after spring and summer rains and according to one report from Mt. Abundance it is most dangerous after the first summer rains.

Evidence of Poisoning:

(*a*) Field: For a long time this plant has been regarded as poisonous by graziers and drovers in Queensland, New South Wales and Western Australia.

(*b*) Feeding tests: Tests in Western Australia showed that sheep could be killed with watery extracts of about 2 lb. of the plant. In New South Wales, sheep fed with this plant scoured badly but showed no other ill effects. Tests at Yeerongpilly were negative, a sheep consuming 8 lb. during a period of one week without effect.

(*c*) Chemical: So far, the poisonous principle has not been discovered. All tests for prussic acid have been negative.

Symptoms: In Western Australia, "staggers," difficulty in breathing and excessive flow of saliva have been reported. Gastritis was noticed in the New South Wales feeding tests. In Queensland, various symptoms have been ascribed to eating this plant, including swellings similar to those attributed to caustic creeper.

Post Mortem: No reliable records of post mortems are available.

Prevention: Paddock sheep neglect bottle-tree caustic. If the plant is plentiful on stock routes, care should be exercised in moving hungry stock through it.

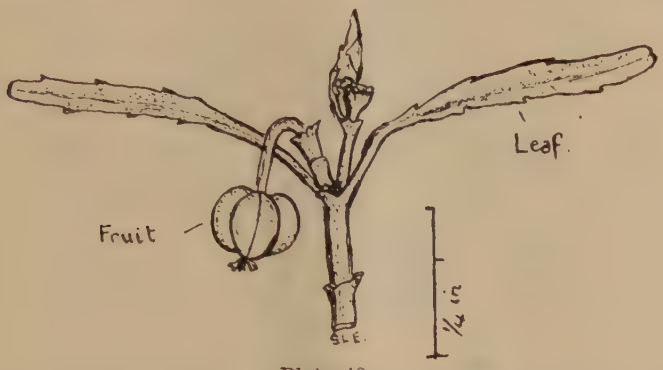


Plate 48.

Bottle-tree Caustic.—End of stem with leaves and fruit.

Flax Weed.

Other Common Names: Wild flax, native flax, broom bush, bootlace plant, Borgia's bouquet, spiked rice-flower.

Botanical Name: *Pimelea trichostachya* Lindl.

Description: Twiggy, much-branched perennial up to 2 feet high; stems slender; bark usually green, very fibrous; leaves about ½ inch long, narrow; flowers small, at first in heads at the ends of the branches but flower-spikes growing continuously until up to 6 inches long; flowers pale yellow with long white silky hairs in lower part. (See Plate 49.)

Distribution: The plant is fairly common in south-western and central-western Queensland, in some seasons forming dense "flax-fields" on the edges of red claypans. It generally favours silty or loamy soils, but is not confined to such situations.

Seasonal Occurrence: Flax weed grows throughout the year and is often green when everything else is dry.

Evidence of Poisoning:

(*a*) Field: On a number of occasions, specimens have been sent to the Department of Agriculture and Stock as a suspected poisonous plant.

(*b*) Feeding tests: At Yeerongpilly, flax weed was fed to sheep with fatal results. All animals had to be force fed. Two sheep died after eating a total of 5½ lb. each, another after eating a total of 6 lb. One died 12 days after the beginning of feeding, one 13 days and one 15 days. All began to scour in from 3 to 5 days.

(*c*) Chemical: No chemical work on the poisonous principle has been reported.

Symptoms: All sheep fed with the plant scoured badly. No other symptoms were noted, the sheep finally being found dead.

Post Mortem: No lesions were found on post-mortem except for some slight congestion of fourth stomach and bowels.

Prevention: Flax weed is extremely distasteful to sheep, but if hungry sheep were brought suddenly on to a green patch of the plant they might eat enough to kill them or scour them badly.

Plate 49.
FLAX WEED.—Dried specimen.

Plate 50.
Common Native Couch.—Dried specimen.

Common Native Couch.

Other Common Names: Gulf star grass, spider grass.

Botanical Name: *Brachyachne convergens* (F. Muell.) Stapf.

Description: Tufted annual grass up to 1 foot high; outer stems spreading at the base and much-branched at the lowest notches; leaves pale, dull green, 1½-3 inches long, 1/10-⅛ inch wide; seed-heads of 3 or 4 radiating "spikes" at the top of a slender, erect stalk; each "spike" 1-3 inches long, with spikelets or "seeds" packed closely in rows along it; spikelets often purplish when young, becoming pale straw-coloured as the plant matures. (See Plate 50.)

Distribution: The plant grows in all parts of Queensland west of the Great Dividing Range with the exception of the far south-west. In addition, it is found in the Charters Towers and Clermont districts. It grows on many soil types, ranging from heavy clay to light sandy loam.

Seasonal Occurrence: The grass comes up after spring and summer rains and dies off in the winter. It is most dangerous when young and green.

Evidence of Poisoning:

(*a*) Field: During the period from January, 1939, to April, 1940, approximately 1,100 sheep died in the St. George district as a result of eating this grass (see the first part of this series). Reports from the Gulf country indicate that the grass is useful for sheep, especially when drying off.

(*b*) Feeding tests: No feeding tests have been reported.

(*c*) Chemical: The plant has been shown to be capable of yielding large quantities of prussic acid when young, but older plants yield insufficient to be dangerous.

Symptoms: Death is usually so rapid that animals are found dead.

Post Mortem: No reports on post mortem have been made.

Prevention: In the St. George district, deaths occurred only in sheep which had previously travelled over bare stock routes and were very hungry. Sheep from the south were fairly well fed before they encountered the grass and no deaths occurred among them. This shows clearly that the only real danger is to hungry sheep. If enough pasture cannot be found to fill them, sheep should be given some hay or other supplementary feed before being driven through patches of common native couch, especially when it is young and green.

Treatment: Affected sheep should be given the hypo treatment immediately symptoms are noted.

Andrachne.

Common Name: No common name has been reported for this plant. The generic name given above seems quite suitable for general use.

Botanical Name: Andrachne Decaisnei Benth.

Description: Erect annual herb, rather woody when old, much-branched and very leafy; leaves alternate, pale green, covered with fine

hairs, ½-¾ inch long, ¼-½ inch wide; flowers inconspicuous in the forks of the leaves; fruit like tiny pumpkin, ⅛-¼ inch diameter, covered with fine hairs, splitting into three parts, each containing two seeds. (See Plate 51.)

Distribution: The plant grows abundantly on black and heavy grey soils in the central-west and north-west.

Seasonal Occurrence: Andrachne comes up after summer rain and dies off in winter. It is most dangerous when it is young and green.

Plate 51.
Andrachne.—Dried specimen.

Evidence of Poisoning:

(*a*) Field: On several occasions the plant has been sent in as a suspected poisonous weed. In one case in the Longreach district affected sheep had been turned into a small yard after shearing and had eaten considerable quantities of this weed.

(*b*) Feeding tests: Feeding tests at Townsville* gave positive results when fresh material was used. A sheep which ate less than 1 lb. died within 50 minutes and a goat drenched with a watery extract from 2 lb. of the plant died in 30 minutes.

(*c*) Chemical: Tests by the Queensland Agricultural Chemist* showed that the plants yield prussic acid, the amount falling off sharply when the plants mature.

Symptoms: In the Townsville feeding tests affected animals showed sudden contractions of the diaphragm, difficulty in maintaining balance, hind legs set well apart, accelerated breathing and pulse rate and laboured breathing. Animals finally were unable to stand, sat down, and finally collapsed on their sides. Convulsive movements were frequent and the animals were greatly distressed.

Post Mortem: Post-mortem appearance has been described as congestion of vessels under the skin, the lining of fourth stomach and sometimes of the first 18 inches of the small intestine. Congestion of kidneys and lungs was also noted and the mucous membranes inside the mouth and the eyelids were blue.

Prevention: Paddock sheep do not eat this plant and even travelling sheep neglect it if there is anything else to eat. If the plants are young and succulent, hungry sheep should be kept off them.

Treatment: Affected animals should be given the hypo treatment.

Red Crumbweed.

Common Name: No common name has been reported for this plant. The above name has been coined to indicate the peculiar crumb-like fruiting clusters and the reddish colour of the stems.

Botanical Name: *Chenopodium blackianum* Aellen.

Description: Herb, usually prostrate, the ends of the branches sometimes erect; stems often reddish; leaves alternate, dull, pale green. $\frac{1}{5}$ to $\frac{1}{2}$ inch long, rounded, the base tapering into a slender stalk; flowers very small, in white globular clusters about 1/12 inch in diameter, all along the stems in the forks of the leaves. (See Plates 52 and 53.)

Distribution: The plant is widespread over the southern half of the State, especially in western areas. It is commonly found in ringbarked country and along roadsides and often favours silty soils.

Seasonal Occurrence: Red crumbweed comes up after summer rain. It is most dangerous when young and succulent.

Evidence of Poisoning:

(*a*) Field: The plant has been accused of poisoning both sheep and cattle.

(*b*) Feeding tests: No feeding tests have been carried out with this plant.

* Churchward, R. E., and Gurney, E. H.: *Queensland Agricultural Journal* Vol. 50, pp. 180-184, 1938.

Plate 52.
Red Crumbweed.—Dried specimen.

(*c*) Chemical: The plant has been found to contain an alkaloid and to yield prussic acid.*

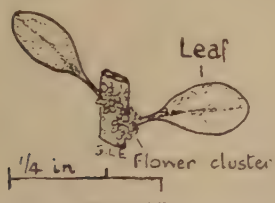


Plate 53.
Red Crumbweed.—Leaf and flower-clusters.

Symptoms: Symptoms are not recorded but they are probably similar to those observed in Andrachne poisoning.

Post Mortem: No record of post mortem examination is known.

Prevention: Care should be taken to avoid bringing hungry travelling sheep on to this plant when it is young. In the paddock sheep do not eat enough to harm them.

Treatment: Affected animals should be given the hypo treatment.

Malvastrum.

Other Common Names: Wild mulberry, wild sida retusa, marsh-mallow, bastard sida retusa, yellow weed. None of the common names is in general use except sida retusa which is more correctly applied to a coastal weed. The name malvastrum is being used to an increasing extent.

Botanical Name: *Malvastrum spicatum* A. Gray.

* Smith, F., and White, C. T.: *Queensland Agricultural Journal*, Vol. 3, p. 264, 1915.

Description: Erect, twiggy, short-lived perennial herb or sub-shrub up to 2 feet high, much branched from the base, leaves alternate, green, toothed on the margins; flowers bright yellow, borne in dense spikes at the end of the branches, persisting for a long time after the leaves have fallen. (See Plate 54.)

Plate 54.

MALVASTRUM.—Mature plant, near Blackall.

Distribution: Malvastrum is a common weed in all sheep-raising districts of Queensland and especially in the western areas. It is often thick on stock routes and other trampled places and is also common in ringbarked country. It grows on a wide range of soils but thrives best on the clays and clay loams.

Seasonal Occurrence: The plant grows quickly after summer rain. The seed-heads persist through most of the winter, though often the plant consists of nothing more than bare twigs during the winter months.

Evidence of Poisoning:

(*a*) Field: Malvastrum and some allied plants have been blamed for the condition known as "humpyback" in sheep, especially in the Tambo, Charleville, Cunnamulla and Bollon districts. The evidence is suggestive but not conclusive. Trouble is experienced mostly with woolly wethers during the hot months.

(*b*) Feeding test: At Yeerongpilly, a feeding test carried out with malvastrum gave results which were suggestive but not conclusive. Symptoms produced in the experimental sheep were not quite those seen in the field.

(*c*) Chemical: No chemical work with this plant has been reported.

Symptoms: "Humpyback," for which this plant has been blamed, has been described as follows:—*"Characteristically, the trouble occurs when full-wool wethers are brought in for shearing. After being driven for a short time some animals are observed to lag behind the mob, assuming a 'humpy back' attitude; their hind legs are straddled and slightly bent, and the affected animals breathe rapidly with their mouths open. The gait becomes awkward and uncertain and the animals soon go down. If left alone they regain their feet but are unable to travel. If forced along they soon collapse and die."

Post Mortem: Post-mortem examination reveals very little. Sometimes there is slight congestion of the mesenteric blood-vessels; sometimes slight inflammation of the kidney and congestion of the lungs.

Treatment: If affected sheep are allowed to rest recovery is usually rapid. Some graziers pick up affected sheep in motor trucks, take them to the shed and shear them. The effect is the same as allowing the animals to rest.

Wild Parsnip.

Other Common Names: Parsnip, parsley.

Botanical Name: *Didiscus glaucifolius* F. Muell.

Description: Tufted annual or biennial herb with numerous thin, hollow, erect branching stems from a thick root; leaves mostly crowded at the base of the plant; leaf-stalks about 3 inches long, leaf-blades divided into narrow segments, bluish-green; flowers small, numerous, crowded into bunches (umbels) at the ends of the branches; fruits small, flat, strongly wrinkled. (See Plate 55.)

Distribution: In Queensland, the plant occurs chiefly in the Cunnamulla, Charleville and Adavale districts but it has been found as far north as the lower Thomson River, near Jundah. It grows on red soils.

Seasonal Occurrence: Wild parsnip comes up after winter rain and dies down in the hot months. August and September are considered to be the most dangerous months.

Evidence of Poisoning:

(*a*) Field: In New South Wales, the plant has been suspected of poisoning stock on numerous occasions. In 1914, reports from Charleville stated that the plant was poisonous to sheep. More recently, it has been

* Moule, G. R.: *Queensland Country Life*, 9th May, 1946.

blamed for losses of lambs in the Cunnamulla district, one report stating that the plant was responsible for killing 25 per cent. of the total lambs dropped.

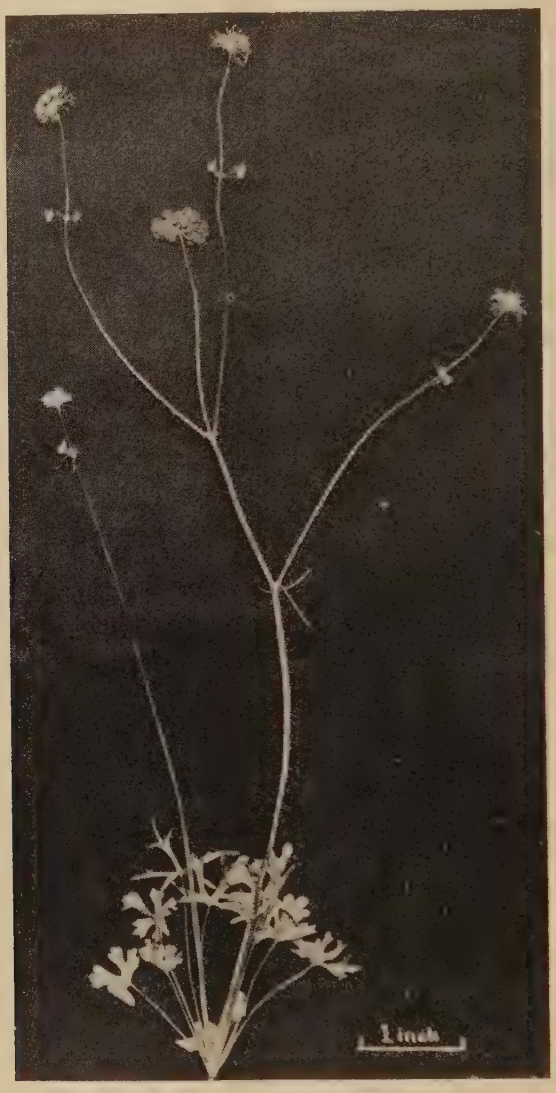


Plate 55.
WILD PARSNIP.—Dried specimen.

(*b*) Feeding tests:* No feeding tests have been made with material from Queensland. Feeding tests in New South Wales gave variable results. Some investigators concluded that the prolonged ingestion of wild parsnip is responsible for gastritis and loss of muscular control and even death, that young sheep are more susceptible than older sheep, and that the poison is cumulative.

* See Hurst, E.: "The Poison Plants of New South Wales," 1942, pp. 305-306.

(*c*) Chemical: Tests on New South Wales material showed the plant to be free from prussic acid and alkaloids. The poisonous principle has not yet been determined.

Symptoms: Various symptoms have been reported from New South Wales. Most cases for which the plant was blamed showed incoordination and some of them reported deformation of limbs in young sheep. In the Cunnamulla district, it has been noted† that symptoms appear when the sheep are driven. They travel only a short distance before they begin to tremble and then fall down and die quickly. Young lambs up to four months old suffer a deformity of joints and become "bandy" in both front and hind legs. Quite a number of cases travel on their knees.

Post Mortem: In New South Wales, post-mortem examination revealed inflammation of the stomach in some sheep, in others dilated heart, fatty liver and inflammatory changes in the kidneys. In the Cunnamulla cases, post mortem has shown a purple discolouration of the blood and the liver shrunken and purple in colour.

Prevention: Until more is known about the disease, no remedial measures can be recommended. During late winter and spring, young sheep, particularly lambs younger than four months, should be kept out of paddocks containing much wild parsnip.

Plants Causing Photosensitization.*

Photosensitization is a condition in which an animal becomes abnormally sensitized to light. On exposure to sunlight, unpigmented portions of the skin suffer a very intense form of sunburn.

The principal cause of this condition is eating of certain plants, followed by exposure to strong sunlight. Different plants cause slightly different symptoms, but in all cases the plants must be young and succulent, they must be consumed in fairly large quantity and the animals must be exposed to strong sunlight.

Symptoms: In Queensland, sheep are known to develop two main forms of the condition. These have been given distinguishing names:—

(*a*) *Trefoil Dermatitis*: The muzzle, face, ears and lower unwoolled parts of the legs are affected. If newly shorn, sheep may also be affected along the back. The animals become uneasy and try to hide their faces in whatever shade is available. The areas affected become itchy and animals rub and lick them if they can. At this stage the affected skin is hot, reddened and somewhat thickened. The thickening is due to fluid under the skin and becomes more and more marked as the condition progresses, the muzzle and ears becoming obviously swollen. Small beads of clear fluid exude through the skin and the overlying hair becomes matted. The skin becomes dried and parchment-like and peels off in large flakes, especially over the face. If rubbed, affected parts become raw and covered with scabs of dried blood. As the fluid within the ears becomes absorbed, the skin shrivels and finally the ears become distorted and half their normal size. When the muzzle is badly affected, the lips may be kept parted, the teeth showing in a peculiar

† Byrnes: Queensland Herbarium records, November, 1942.

* Particulars of symptoms and post mortems supplied by Mr. G. R. Moule, Veterinary Officer (Sheep and Wool).

grin. The coronary band at the edge of the hooves becomes purplish and in bad cases the outside of the limbs may show changes as seen in the face.

(*b*) *Yellow Bighead*: In this condition, jaundice is present as well as the more obvious effects of photosensitization. Animals become uneasy and seek the shade. There is swelling of the face, lips, muzzle, eyelids, and the skin over the nose and cheeks. The ears and lower parts of the limbs also are affected. The whites of the eyes become intensely yellow; the membranes lining the eyelids, the inside of the mouth and the skin become pale, muddy yellow. There is crusting of the eyelids, the skin of which becomes leathery and the eyelids cannot close properly. Inflammatory changes may affect the eyes, causing blindness. The

Plate 56.
BULLHEAD.—Dried specimen.

leathery lips remain parted. Upset to the liver causes the animals to lose condition and sometimes to die. Young sheep (weaners) are more likely to be affected than grown animals.

Post Mortem: Examination shows the tissues to be bright yellow and the liver and kidneys copper-coloured.

Plants Responsible:

(*a*) *Trefoil Dermatitis*: Two plants grow in Queensland which are known to be capable of causing the disease. They are the burr medic or burr trefoil (*Medicago denticulata*) and the small burr trefoil (*Medicago minima*). Both come up after winter rain and are more plentiful in the Darling Downs district than in the sheep-raising areas farther north and west. Both are leafy, prostrate herbs with clover-like leaves, yellow flowers and curly pods covered with soft "spines."

Plate 57.

Onion Weed.—Mature plant, north of Charleville.

(*b*) *Yellow Bighead*: Yellow bighead is much more common in Queensland than is trefoil dermatitis. Various plants have been blamed for causing it. In New South Wales it was found that the native barley grass (*Panicum decompositum*) could cause the disease. In cases observed in Queensland it has been difficult to say exactly what plants were responsible. On field evidence the following have been suspected:—

Paddymelon (*Cucumis trigonus*): This is a weak creeper bearing small melons. It usually grows in heavy soil.

Prickly Cucumber (*Cucumis myriocarpus*): This is similar to paddymelon but has soft, curly "spines" on the fruits.

Bullhead (*Tribulus terrestris*): This is also known as goathead, cat's head, caltrops or three-corned Jack. It is a prostrate creeper with fern-like leaves and yellow, butter-cup-like flowers. It bears burrs with three hard, sharp spines. (See Plate 56.)

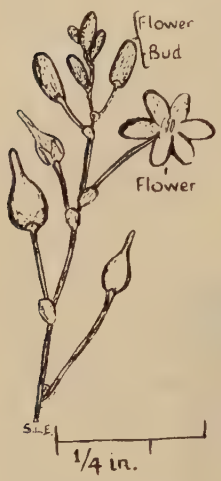


Plate 58.
INFLORESCENCE OF ONION WEED.

Onion Weed (*Bulbine semibarata*): This is a tufted plant with succulent, greyish-green leaves, thick and fleshy at the base, tapering to a fine point. The flower-spikes are erect, up to 1 foot high, and bear small yellow flowers. (See Plates 57 and 58.) It often grows on red loams and clay-loams.

All the above plants grow profusely after summer rains and in good seasons are very green and succulent during the hot weather. It is possible that almost any very green, succulent plant can cause photosensitization in sheep subjected to very strong sunlight.

Treatment: Affected sheep should be put into well-shaded paddocks, preferably where the pasture is different. Badly affected animals should be put in a hospital paddock and the affected parts, especially around the eyes, anointed with carbolized olive oil. Rubbing lampblack or other opaque substances over unwoolled parts often prevents sheep from being affected.

Additional Note on Weir Vine.

After the original material on weir vine poisoning was supplied for publication in the *Journal*, more detailed information became available as a result of feeding trials carried out by the Department. The following additional notes, based on information provided by Mr. G. R. Moule (Sheep and Wool Branch), are given.

Feeding Tests: Feeding tests recently conducted in the field have given positive results. Sheep allowed free access to the weir vine in a confined space developed symptoms after five weeks. During some of the time they had to be hand-fed and their average consumption was 15 lb. of weir vine per head per day.

Symptoms: At first, there is marked loss of condition, then the sheep stands with rump slightly arched and back legs drawn up underneath the body; the head is held high, usually with the ears laid flat. Later, the animal tends to point the nose skywards, the body muscles tremble and the gait becomes uncertain; the arching of the back is accentuated and there is a tendency to lift the tail. In the final stages, the animal urinates copiously and frequently. It staggers badly when walking, the hind legs being straddled, apparently in an effort to maintain balance, and the sheep seems no longer able to judge the kind of obstacle it encounters when walking through yards or timbered country. It is not uncommon to see affected sheep pushing against rails, trees or fences and making little effort to go around them. When this stage is reached, the animal usually dies fairly soon, either from accident or apparently as a result of the weir vine poisoning.

Post Mortem: Post-mortem examination reveals little except slight patchy discolouration of the pyramidal zone of the kidney. The heart muscle is rather flabby. Microscopic examination of the kidney shows marked destructive changes, the tubules which flow through the pyramids being almost completely destroyed. This is probably sufficient to account for the marked loss of condition and the frequent urination. Symptoms indicate that there is functional disturbance of the brain as well.

Prevention: Further field studies indicate that the plant is poisonous even when dry, so that care must be exercised in pasturing sheep on weir vine country even after the vines are dead.

Acknowledgments.

In writing this account use has been made of many published papers and books. In particular, Miss Evelyn Hurst's excellent compilation, *The Poison Plants of New South Wales*, has been drawn upon freely. Unpublished data from the minutes of the Queensland Poison Plants Committee, the files of the Department of Agriculture and Stock, and the records in the Queensland Herbarium have also been used. Some of the observations are original.

Mr. G. R. Moule, Veterinary Officer (Sheep and Wool), has given valuable assistance on the veterinary side. Advice from Mr. C. T. White, Government Botanist, and from Mr. W. D. Francis, Botanist, is gratefully acknowledged. Mr. L. J. Webb, of the Council for Scientific and Industrial Research, has supplied references and other data and this, too, is appreciated. Most of the illustrations are original and thanks are accorded to Mr. W. J. Sanderson, Photographer, Department of Agriculture and Stock, for assistance with photographs.

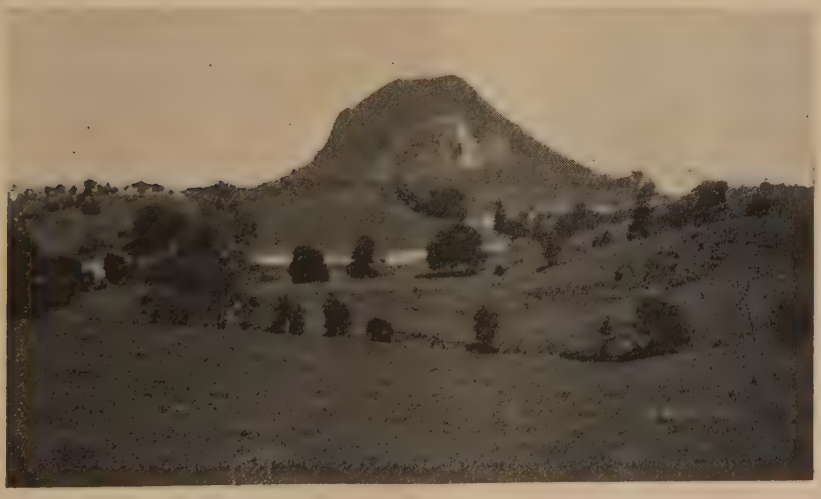


Plate 59.

In the Gympie District, South Queensland.

PLANT PROTECTION

Recent Locust Outbreaks in South Queensland.

N. E. H. CALDWELL, Entomologist.

THE last serious outbreak of the Australian plague locust* occurred in 1937 and 1938 in various parts of southern Queensland—the Darling Downs and adjacent areas being the worst affected. Following this outbreak the pest declined in importance for some years. In the spring of 1945 locusts were again reported in the Maranoa district in the vicinity of Roma. The exact extent of the outbreak and the damage done were not clearly defined but the infestation apparently remained fairly localized. By the spring of 1946, the problem again threatened to become serious. Hopper bands were reported in several areas and, because at least one of these involved high-value agricultural lands on the Darling Downs, the outbreak attracted considerable attention. The two main areas affected were the Bowenville-Jondaryan section of the Jondaryan Shire and portions of the Waggamba Shire, near Goondiwindi.

The Bowenville-Jondaryan Outbreak.

Hoppers were reported in the first week in November, 1946. An investigation revealed that they were then in the fourth and fifth nymphal stages; hence hatching must have taken place early in October. Local inquiry revealed that flying swarms had been present in the previous April. These swarms undoubtedly laid the eggs from which the spring generation of hoppers emerged. The egg-beds were mostly located in hard, clay ridges along the banks of Oakey Creek to the south of Bowenville.

In the latter half of November, these hoppers matured and most of the resulting fliers migrated in a general south-easterly direction. During late November and December, a number of egg-beds were established in a tract of country about ten miles long and five miles wide to the south of Jondaryan. These gave rise to the main hopper bands of the next generation. Some fliers moved south, however, but only a small number of insignificant hopper bands developed in the areas invaded. Hoppers in the second generation were first reported at the end of December, but hatching had obviously started about the middle of the month. The infested country was seriously drought-stricken at the time and practically no green grass existed. The immediate threat was to a number of summer crops, mainly sorghum and panicum, which, though not specially attractive to grasshoppers, may, in the absence of other feed, be seriously damaged.

Because of this threat and also of the possibility that a subsequent locally-bred generation might damage early-planted winter crops, farmers in the district organized a control campaign, assisted by the Jondaryan

Shire Council acting in accordance with the provisions of "*The Plague Grasshoppers Extermination Act of* 1937." The position was complicated by an acute shortage of some ingredients in the standard poison bran bait and the small quantity of bait available was supplemented by oil spraying on a fairly large scale. When supplies of used engine sump oil (usually diluted with kerosene) were exhausted, large quantities of tractor fuel oil were employed.

The oil was applied partly by bucket pumps or stirrup pumps and partly by an improvised, power-driven spraying plant mounted on a truck, from which three men sprayed the hopper band from independent hoses as the truck was driven slowly through it. This contrivance worked reasonably well and was obviously a considerable improvement on the manually operated bucket pumps.

Farmers in this district gave a fine display of co-operative effort and a reasonably satisfactory job has been done in cleaning up this somewhat restricted outbreak. A number of small hopper bands were undoubtedly missed and, of course, some insects escaped from treated bands. The danger to existing crops was certainly averted, however, in most cases. Several factors tended to hamper operations, the main ones being:—

1. A rather late start in organizing the campaign.

2. The occurrence of a large number of small, scattered egg-beds rather than a small number of large, well-defined ones.

3. Desertion of the egg-bed site by the hopper bands very soon after hatching, a phenomenon presumably resulting from a shortage of food.

4. Rapid rate of movement of hopper bands, often with frequent changes of direction.

5. Difficulty of spraying hopper bands once they had invaded well-grown crops, though quite successful control was obtained in some cases under these circumstances.

The cost of the control campaign has been comparatively high. The somewhat spectacular, immediate effect of oil spraying is inclined to outweigh all other considerations in the minds of observers, but this method of treatment is obviously much more expensive than bran baiting. At a very conservative estimate, fifty gallons of oil are required to treat one acre of hoppers by the methods employed. With oil at approximately 1s. per gallon, the cost of materials alone is thus about £2 10s. per acre. On the other hand about 36 lb. of bran are sufficient to bait one acre. The current price of bran at Toowoomba is £7 11s. 4d. per ton, that is, slightly less than one penny per lb. Thus, making generous allowance for the arsenic pentoxide and molasses portions of the bait, the cost of materials for bran baiting could not exceed 5s. per acre. Where all labour is voluntary and unpaid, the cost of materials is the main item of expenditure. The advantages of bran baiting from this point of view are, therefore, very marked. Also much experience has shown that this method loses little, if anything, in comparison with others on the score of efficiency in killing hoppers, provided, of course, that the baiting is done properly in accordance with well-established principles.

The Goondiwindi Outbreak.

The Goondiwindi area is a notorious danger spot for outbreaks of the Australian plague locust. On this occasion, very dense swarms of fliers were reported in the third week in November. An investigation

showed that hopper bands had been present earlier in the spring, but did not attract much attention. However, these bands were almost certainly rather more extensive than at first admitted. Some interstate migration of flying swarms also took place, as this danger zone in Queensland is contiguous with a similar area in northern New South Wales.

The first hoppers of the second generation were reported in December. In subsequent weeks, large bands appeared at a number of points over a tract of country about 70 miles long by 30 miles wide. Much damage was done to grass on a number of properties and a few cultivated cereal crops were eaten out. Fortunately, tobacco crops were not attacked. Towards the end of January, swarms of fliers were again encountered though hoppers in various stages were still present in a number of places.

No district-wide control campaign was undertaken by the local authorities, the estimated cost being generally considered out of proportion to the value of the grass which could be protected. Complications were the difficulty of locating hopper bands on some of the larger holdings in this district and the risk of invasion by flying swarms from adjacent pastoral areas in which control measures cannot be applied efficiently. However, a number of graziers with valuable interests at stake applied control measures to hopper bands on their properties.

Other Areas Affected.

Various reports of locust activity were received from Roma, Dalby, and Leyburn. In the first-named area, between Roma and Injune, some damage was done to cereal crops. Otherwise little further was heard from these centres and it is assumed that the outbreaks did not reach serious proportions. An extreme shortage of feed resulting from severe drought conditions may have been at least partly responsible.

Prospects for the Immediate Future.

The autumn generation of hoppers is seldom as destructive as the earlier ones. During the wet months, conditions are inclined to be unfavourable for breeding and autumn bands are therefore not usually as extensive as those of the spring and mid-summer generations. Also, there is normally an abundance of feed following the wet season. In any case, control operations carried out in the Jondaryan Shire should ensure freedom from a serious infestation of the hopper stage in the next two months and the autumn generation of locally-bred fliers is unlikely to be extensive enough to give rise to a serious infestation in this area next spring. There remains the possibility of an invasion of fliers into agricultural areas of southern Queensland, from pastoral areas further west. Such an invasion in autumn could lead to outbreaks of hopper bands during spring.

Good February rains in all affected districts will ensure recovery of eaten-out pastures and an abundance of grass at least until the winter. Any flier swarms or hopper bands appearing in the autumn should not make serious inroads into the grass reserves, while cultivated crops are less likely to attract the pest's attention when grass is plentiful.

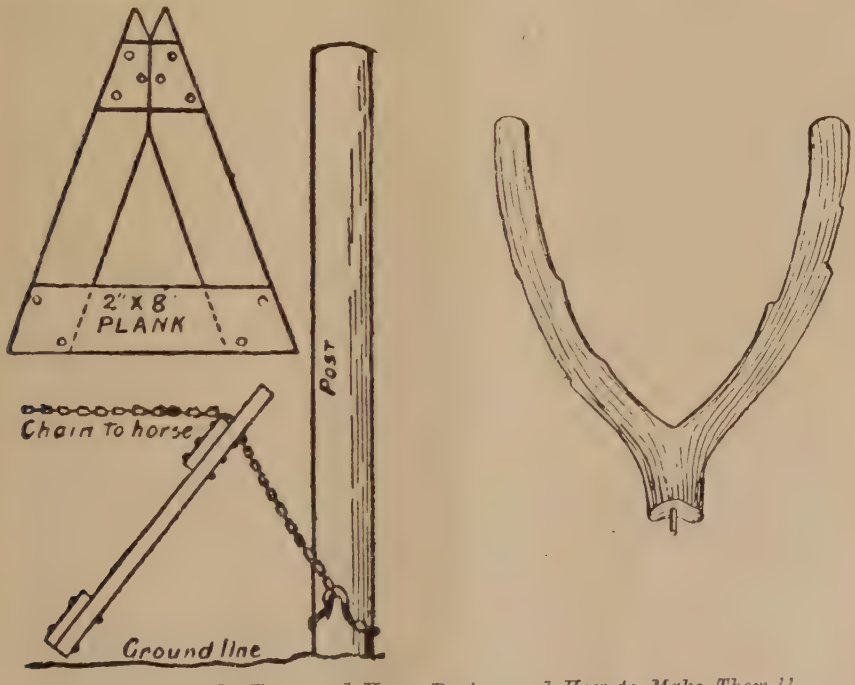
Need for Early Reporting of Outbreaks.

Although a locust* control campaign may be impracticable in pastoral areas, it is usually well repaid by results in agricultural districts. The responsibility of organizing control measures lies with the local authorities. The functions of the Department of Agriculture and Stock are to co-ordinate reports, to assess the extent of outbreaks and the practicability of undertaking control measures, and to give technical advice on methods of control and other points. The authorities concerned can perform their various functions efficiently only if they have adequate warning of an outbreak. An early start is an essential requirement of control operations. Landholders are therefore urged once again to report immediately to the nearest officer of the Department, or to their Shire Office, unusual activity on the part of any species of plague locust or grasshoppers.

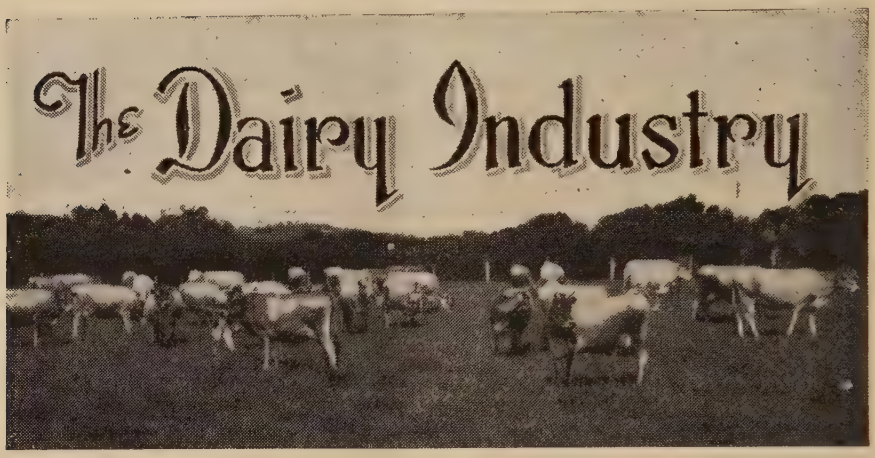
* *Chortoicetes terminifera* Walk. The term "locust" is applied to this and some other migratory species; grasshoppers do not migrate.

HOW TO LIFT AN OLD FENCE POST.

Taking out an old fence post is often a difficult job. A device like the one illustrated will enable a horse to get an almost vertical pull. The same idea can be applied by using a fork of a tree, cut as shown in the sketch on the right. In the base of the forked branch a notch is cut and a piece of round iron, such as a headless bolt, is driven into the centre of the notch. A link of the draw chain is pulled over the spike to prevent the chain from slipping as the horse takes the strain to pull out the post.



—*From "Handy Farm and Home Devices and How to Make Them."*
(J. V. Bartlett for War Blinded Association, Adelaide, S.A.), 1946.



The Cooling of Milk on the Farm.*

F. G. FEW, Dairy Technologist (Engineering).

RAPID deterioration in the quality of milk produced on the farm soon follows unless means are available for its immediate cooling while milking is in progress.

The milk entering the vat from the milking machine will be found to have a temperature around 95 degrees F., which is generally about 20 degrees F. or so above the atmospheric temperature at the time of milking. It will be seen, therefore, that the milk would tend to fall in temperature if allowed to stand, but the cooling rate is so slow as to be useless for safeguarding quality. The problem then is to devise some means to ensure rapid cooling.

After considerable experimental work, cooling with recirculated water has been found to be very effective. Details of this system have already been published.† By this method the milk is allowed to gravitate slowly over a tubular surface cooler through which recirculated water is continuously forced by a small centrifugal pump driven from the dairy house mainshaft. As the water becomes warmed up by the milk it is essential to provide for its continuous cooling, and this is the purpose of the 12 ft. high by 4 ft. square water-cooling tower. During its passage from the top of the tower to the shallow pit beneath, the water is cooled to or near the existing wet-bulb temperature, the value of which depends on existing atmospheric conditions. For most of the dairying districts of the State the wet-bulb temperature is not appreciably over 70 degrees F., even under summer conditions, while for the remainder of the year it is generally very much below this value. As a result milk can be cooled by this method to around 70 degrees F., even during hot weather, and this represents a temperature drop of about 25 degrees F. in a very short interval of time. This technique is already in very extensive use in the Beaudesert area, one of the districts supplying whole milk for the metropolitan area.

Another type of milk cooler was designed recently with the object of cooling the product while milking is in progress. Although employing

* A Country Hour. Radio talk, A.B.C. (4QR).

† *Queensland Agricultural Journal*, May, 1946.

similar principles, the milk is cooled directly by this method without the use of water as an intermediate agent. Tests have shown, however, that the model first developed has not sufficient cooling capacity to be generally applicable, although up to its limit comparable results to those obtained by the earlier described method do result. The designer has undertaken to construct a larger unit and further tests are likely in the early future. Briefly, the method consists of feeding the milk from the vat into an inverted and enclosed dome in which it is met by an upward draught of filtered air. This is provided by a fan unit which can be driven from the dairy house mainshaft with the absorption of a minimum of power. The air causes the milk to be dispersed in a fine spray and this results in its being cooled by partial evaporation to a temperature which can be as low as the wet-bulb temperature under existing atmospheric conditions. It is also claimed that such extensive aeration tends to remove objectionable weed and feed flavours to some degree. This claim has not so far been finally substantiated, but preliminary tests would indicate definite possibilities with regard to at least feed flavours.

Methods capable of cooling freshly drawn milk to about 70 degrees F. have now been described. This temperature drop of approximately 25 degrees is the minimum that can be anticipated, as it applies only to the hottest weather. During the cooler months temperatures much below 70 degrees F. will be realized, the actual values obtained being dependent on local atmospheric conditions.

Generally, the degree of cooling possible will be quite satisfactory for milk for cheese manufacture, especially in areas on the Darling Downs, where conditions are good because of the usually low relative humidity. For milk for the whole milk trade, however, the best results are obtainable only by the additional use of refrigeration in conjunction with one of the methods earlier described.

In this connection, production of suitable farm refrigeration units has already been commenced. These are being sponsored by the Queensland Butter Board and will provide farm refrigeration for a minimum outlay. Two models have so far been developed to hold four and six cans, respectively, each can being of the common 10-gallon capacity. In these, the cans of milk already cooled to at least 70 degrees F. are placed in a tank containing water chilled to 33 degrees F. Agitation of the chilled water by the use of sprays results in the temperature of the milk falling 20 degrees F. within one hour, resulting in a temperature one hour after milking not exceeding 50 degrees F. even during the hottest months of the year. These units can be recommended for farmers wishing to hold the night's milk for delivery the following morning, but are not normally an advantage if a twice-daily delivery service exists. One important additional feature, however, is the inclusion within the refrigerator unit of a cabinet for household purposes. All the advantages of domestic refrigeration are thus available to the farmer's wife without interfering with the primary purpose of the installation, namely, the cooling and cold storage of all milk produced on the farm.

When the summer conditions in most dairying districts of Queensland are considered, the necessity of taking every care of such a perishable product as milk becomes obvious. The methods described have this object in view, enabling every satisfaction to be obtained with the bare minimum of initial outlay.

Field Day at Mount Mee.

LOOKING back and around over the Pine River Valley from points of vantage on the gradually ascending winding road from Dayboro' to Mount Mee, the wayfarer is rewarded with a view of one of the finest panoramas in Queensland, of a countryside renowned for its scenic beauty as well as for its dairy productivity. The reward is even greater when the summit is reached. Mount Mee is 40 miles from Brisbane, and from its rich surrounding pasture land comes a large volume of the metropolitan daily milk supply.

Arranged by the district branch of the Queensland Dairymen's Organization in association with the Department of Agriculture and Stock, the farm field day at Mount Mee on 10th February was a notable local event. Mr. A. H. Duncan's fine property was the venue and there were gathered many district farmers and the senior pupils from the nearby State school, who, in the course of the proceedings, learnt much of the value of the advisory services now available to the primary producer through the Department of Agriculture and Stock. Mr. E. Sutherland, Dairy Machinery Adviser, was the chief speaker. He lectured lucidly and interestingly on the care and maintenance of separators and milking machines, using models and Mr. Duncan's dairy equipment to illustrate his instructional address. Mr. S. A. Clayton, Dairy Officer of Caboolture, assisted in the demonstrations.

Mr. Sutherland stated that the dairy machinery service instituted by the Department was designed to assist the producer to attain the highest degree of efficiency in the operation of his plant. Speaking of the importance of the separator in the production of choice quality cream, he said that incorrect installation was often the cause of poor performance of a machine. Although it might seem a trifling fault, if a separator were not dead level much avoidable wear would be caused in its moving parts. Wrong grades of oil also were among the causes of wear. Incorrect speed was a cause of variation in cream tests. Slipping belts tended to vary the speed, and as a separator bowl revolved 7,000 times per minute, the resultant jerkiness caused excessive wear, with a consequent test variation. Other causes of impaired machinery performance were described in detail.

Dealing with the operation of the milking machine, Mr. Sutherland pointed out that a high vacuum pressure was a prevalent cause of mastitis in dairy cows. It was necessary that the vacuum gauge should be tested regularly. The importance of proper care of the rubber equipment was stressed. Any incorrectness of adjustment caused leaks in the system. As there was frequently only a narrow margin between choice and first grade cream, Mr. Sutherland impressed on his hearers that attention to the points he had mentioned would mean higher grades and better returns. Correct supervision of a dairy plant paid a dividend, and the additional amount of care necessary should become part of the dairy routine. Co-operating with the technologist and the technician, the producer could attain the height of efficiency in dairy production.

Similar field days have been arranged for every dairying district in the State; those already held have proved of definite advantage to the industry generally.

Plate 60.

Dairy Machinery Field Day on Mr. A. H. Duncan's Farm at Mount Mee.—Group of interested farmers and school children.

Plate 61.

Junior Farmers of Mount Mee.—They showed intelligent interest in both the lecture and the practical demonstrations.

Plate 62.
THE LECTURER DEMONSTRATES A POINT IN MILKING MACHINE OPERATION.

Plate 63.
THE LECTURER PAUSES TO HEAR A QUESTION ON HOW TO CHECK A LEVEL.

Are Heavier Pigs More Profitable than Light?

B. R. MARTIN, Adviser, Pig Branch, Toowoomba.

IT is a well-known fact that young pigs make larger gains than older ones for the same amount of food. This applies both to liveweight gains and dressed weight gains for pigs over 100 lb. liveweight. The following table illustrates this clearly.

TABLE 1.

Liveweight Range.	Food for 1 lb. Liveweight Gain.	Food for 1 lb. Carcase Gain.	Per Cent. Dressed Carcase.	Offal.	Carcase Gain for Range.
Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
		Series 1.			
50–100 ..	4·0	5·15	77·7	22·3	77·7
100–150 ..	4·37	5·07	81·0	6·2	43·8
150–200 ..	4·82	5·23	83·4	4·7	45·3
200–250 ..	4·98	5·48	85·0	4·3	45·7
250–300 ..	5·11	5·43	86·4	3·0	47·0
		Series 2.			
150–200 ..	4·18	5·03	76·7	9·0	41·0
200–250 ..	4·58	5·38	78·0	7·5	42·5
250–300 ..	5·10	5·93	79·3	7·2	42·8
		Series 3.			
Birth–100 ..	3·04	3·91	77·7	22·3	77·7
100–200 ..	3·59	4·0	83·4	10·9	89·1

But in Queensland it is dressed weight, not liveweight, that we are concerned with, as pigs are sold for slaughter at "so much per lb. dressed weight." Pigs consigned to factories are paid for according to actual dressed weight; those sold to factory agents over the scales are paid for according to estimated dressed weight using a chart; and at auction sales the buyer makes his price estimate according to his personal estimate of the dressed weights.

An examination of Table 1 shows that there is a greater range in the figures of the "liveweight gain" column than in those of the corresponding "carcase gain" column. It will also be seen that the heavier the pig, the higher the dressed carcase percentage.

This suggests that despite the cheaper liveweight gains in young pigs, the greater percentage of carcase developed in older pigs (with less waste as offal) may counteract this to such an extent that there is greater profit in feeding pigs to heavy weights. In fact this appears to be the case.

A recent United States Department of Agriculture Bulletin presents evidence of this. It is based on an analysis of 12 experiments involving 813 pigs. The object has been to find at what weights pigs should be sold to give the greatest return for food given to them.

There are three ways of looking at this problem, if we ignore the question of prices ruling for the sale of pigs:—

(1.) If we total separately the food used in raising pigs to various weights and find the pounds of food required to produce 1 lb. of live pig in each case, at what weight would the least food be used per pound of live pig? These totals must include food used for the dry sow. (See Table 2.)

(2.) Using the total in (1) then at what liveweight would the least food be used per lb. of dressed carcase?

(3.) Using this total again, at what liveweight would the least food be used per lb. of edible product produced?

The answers to these 3 questions were found to be:—

(1.) 130—200 lb. liveweight.

(2.) 225—275 lb. liveweight.

(3.) At some weight greater than 175 lb. liveweight.

TABLE 2.

Liveweight Range.	Food for 1 lb. Liveweight Gain.	Food for 1 lb. Liveweight Gain. Corrected for Weight.
Lb.	Lb.	Lb.
0– 35 ..	7·66	4·85
35– 50 ..	3·4	4·54
50–100 ..	3·5	4·12
100–150 ..	3·84	4·04
150–175 ..	4·18	4·04
175–200 ..	4·28	4·07

The answer to question (1) is perhaps the most surprising, but can be readily explained by reference to Table 2. It is seen that the food required for 1 lb. gain in early life is 7.66 lb., which seems quite ridiculous. However, approximately 150 lb. of food which has been fed to the sow while dry and during growth (part only of her food) must be added to the cost of raising each pig in the litter. As it has already been used it is included in the first period of the young pig's growth.

Looking across to the 3rd column (corrected weight) the corresponding figure is only 4·85 lb. This is because an adjustment has been made which takes care of the sale value of the sow and the boar; therefore, in this case 20·3 lb. is added to the liveweight of the market pig before working out the food used per lb. liveweight gain.

Similar adjustments are made in obtaining the answers to questions 2 and 3, being 16·9 lb. dressed weight and 15·4 lb. edible product, for which figures are shown in Table 3.

TABLE 3.

Liveweight Range.	Food for 1 lb. Carcase. Gain Corrected.	Food for 1 lb. Edible Products. Corrected.
Lb.	Lb.	Lb.
150–175 ..	5·33	6·76
175–200 ..	5·31	6·63
200–225 ..	5·30	6·53
225–250 ..	5·33	6·47
250–275 ..	5·33	6·42

It is quite easily seen then that from the standpoint of quantities of food used, the most economical pig is one sold at much heavier weights than was formerly supposed. It is also quite obvious that the man who sells store pigs and weaners stands to lose more than anyone else, unless of course he gets more than equivalent bacon price per pound.

There are also many supporting factors which force the conclusion that the most profitable pig for the farmer is a heavyweight, provided, of course, his grading is good.

(1.) Heavier pigs make better use of roughage.

(2.) More tons of pigmeat can be sold with the same equipment and capital outlay.

(3.) Labour cost per ton of meat produced is less.

(4.) The percentage of losses in young pigs, per ton of meat sold, is less.

(5.) There is less shrinkage on curing in heavy pigs and a smaller loss when trimming.

(6.) As seen by the figures for "edible product" in Table 3 the average gains are increasingly economical up to a liveweight over 275 lb. This is of importance to all shareholders in co-operative factories, because profits ultimately depend on the proportion of edible products available for sale to the public.

(7.) As the known dressing percentages of pigs of various weights range from 65 per cent. to 80 per cent., the advantage in many cases will be greater than indicated by the tables.

The chart used by bacon factories in Queensland for buying over the scales covers the range from 66 per cent. for pigs of 150 lb. to 73 per cent. for pigs at 250 lb.

An experiment with 75 pigs, all of one breed and from one farm, showed dressed weight percentages of 66 per cent. for 130 lb. pigs and 74·5 per cent. for 190 lb. pigs.

Where the variation in percentage dressed weight is so much greater than in the tables, a still greater profit from the heavyweight pig can be expected.

ANIMAL HEALTH

Cattle Lice.

F. H. S. ROBERTS, Animal Health Station, Yeerongpilly.

THERE are few districts in Queensland where lice are not serious on cattle at some time or other. Both dairy and beef cattle of all ages are affected. The pests are most troublesome during the winter and spring when the pastures are dry and the animals poor in condition. Heavy infestations may sometimes be seen also at other times of the year, and in such cases are associated either with drought or general unthriftness. Animals which are stabled for any considerable length of time may also carry large numbers of lice. The conditions under which lice become serious are not fully known, but are thought to be associated with the condition of the skin and coat. It is known that the heavy infestations which occur during dry seasons dwindle to insignificant proportions shortly after good rains have fallen.

Lice feed upon the tissues of the host. They cause considerable irritation, and to relieve this the animal scratches and rubs itself against any convenient object. As a result, there is a marked loss of hair, the skin becomes scaly, and large sores and scabby areas are formed. Cattle are unable to feed and rest to the normal extent. The final effect is a loss of condition, which at times can be severe. The infestations are all the more serious as they usually occur during dry times, when cattle find it difficult to secure sufficient nourishment for their own bodies without feeding large numbers of lice as well. Lice, by lowering the vitality of an animal, also render it more susceptible to inclement weather conditions and to other diseases. Thus the damage and loss caused by lice are sufficiently serious to warrant careful consideration and the application of efficient treatment.

SPECIES OF LICE.

Five species of lice are found on cattle. Four of these are sucking lice—namely, the buffalo louse (*Hæmatopinus tuberculatus*), the short-nosed louse (*Hæmatopinus eurysternus*), the long-nosed louse (*Linognathus vituli*), and the tubercle-bearing louse (*Solenopotes capillatus*). Sucking lice have a pointed head. The mouth-parts are terminal in position, and are tubular to enable the insect to pierce the skin and suck up the blood and fluids on which it lives. The fifth species is a biting louse (*Damalinia bovis*). Biting lice have a broad, squarish head. Their mouth-parts are built only for biting and chewing and are placed on the under surface of the head. Biting lice live on the scales, scurf, and other material which is found on the skin surface.

Sucking Lice.

The Short-nosed Louse.—Of the four species of sucking lice, the short-nosed louse (Plate 64) is the most prevalent and the most serious. It is a comparatively large louse, up to one-eighth of an inch in length.

The head is about as broad as long, and the three pairs of legs are all about equal in size. When the louse is alive, the head and thorax are yellow-brown in colour and the abdomen a greyish-blue. This louse has a very wide distribution throughout the State, and is most usually found on grown cattle.

Plate 64. [*I. W. Helmsing.*

The Short-nosed Cattle Louse (*Hæmatopinus eurysternus*) × 48.

The Buffalo Louse.—The buffalo louse is known to occur on cattle in the Gulf districts. It is not very common and is probably not a serious pest. This species is very similar in general appearance to the short-nosed louse, from which it can be distinguished only by microscopic examination.

The Long-nosed Louse.—This species (Plate 65) is next in prevalence and importance to the short-nosed louse. It is usually found on young cattle, but is by no means uncommon on grown animals, especially dairy cattle. It has the same general colouration as the short-nosed louse, but

is smaller and more slender in appearance. The head is long and narrow, being much longer than broad, and the forelegs are smaller than the middle and hind legs.

The Tubercle-bearing Louse.—This louse gets its common name from the position of the abdominal spiracles or breathing pores, which open on small laterally-placed tubercles (Plate 66). It is the smallest of the sucking lice, and is only about half the size of the short-nosed louse. It has a short, bluntly-rounded head, and, as in the long-nosed louse,

Plate 65. [*I. W. Helmsing.*

THE LONG-NOSED LOUSE (*Linognathus vituli*) × 48.

the forelegs are smaller than the middle and hind legs. This louse is probably a comparatively recent introduction into Queensland, but is now well distributed over the southern part of the State.

Habits and Life History.—Sucking lice feed in groups or clusters and are usually found on the top of the head, around the eyes, on the neck, brisket, withers, rump, tail, inside the thighs, and on the scrotum or udder. The most favoured sites are those from which the animal has most difficulty in dislodging them. Their habit of feeding in groups, and the fact that they feed by piercing the skin, make sucking lice more serious than biting lice.

Plate 66. [*I. W. Helmsing.*

THE TUBERCLE-BEARING LOUSE (*Solenopotes capillatus*) × 48.

Plate 67. [*I. W. Helmsing.*

THE BITING LOUSE (*Damalinia bovis*) × 48.

The female louse attaches her eggs or "nits" to the hairs of the coat, usually low down near the skin. The eggs of the short-nosed louse hatch in 11 to 18 days. The young lice differ from their parent chiefly in size, and in about 12 days after hatching are mature and commence laying eggs. In the case of the long-nosed louse, the eggs hatch in 10 to 14 days, and 11 days later the lice mature. The eggs of the tubercle-bearing louse hatch in 10 to 13 days.

Biting Louse.

The biting louse (Plate 67) is not uncommon, but is neither as prevalent nor as important as either the short-nosed or the long-nosed species. It is a small louse, with a broad, blunt, reddish head and a yellowish-white abdomen. The shape of the head readily distinguishes it from the sucking lice. It may occur on cattle of all ages.

Habits and Life History.—Biting lice are found most commonly on the top of the head, on the neck, shoulders, withers, along the back, hips and rump. Although not considered as serious as sucking lice, when sufficiently numerous they are capable of causing considerable irritation and annoyance. The eggs, which are glued to the hairs, hatch in about nine days, the young lice reaching maturity about 14 days later.

TREATMENT AND CONTROL.

Lice live and breed only upon the body of the animal. Occasionally they may become detached from the host, in which case biting lice are said to live as long as seven days and sucking lice about four days. It is possible, therefore, that there may be a risk of infestation from yards and stables which have held lousy cattle; but the chief manner by which lice spread is by contact. By treating infested animals, the infestations can be controlled and, if the treatment is carefully carried out, completely eradicated.

There are several insecticidal materials available which, if used according to directions, will give satisfactory control. These may be applied either by dusting, washing, spraying, or dipping.

Dusting.

Of the various dusting powders that have been tested, a DDT dust in pyrophyllite, at a concentration of 5 to 10 per cent. DDT, is the most effective. One application will kill both biting and sucking lice and will give control over a period of one to three months. Sufficient DDT remains on the animal to destroy any lice hatching from the eggs, which are not affected by this insecticide.

Another effective dust can be made by mixing 1 part of phenothiazine and 2 parts of sodium fluosilicate with 5 parts of flour. At least two treatments with this dust are necessary with a 14-16 days' interval between them.

Dusts are applied by means of a shaker and *rubbed well into the coat by hand,* paying particular attention to the under side of the animal.

Spraying or Washing.

Where small herds are to be treated, aqueous solutions or emulsions may be satisfactorily applied by spraying or washing.

A stirrup pump or knapsack spray is suitable for spraying. The animals must be thoroughly wetted and for this a good pressure in the pump and 2 to 3 gallons of fluid per head are necessary.

In washing, the fluid is applied to the body by means of a cloth or brush.

DDT

Emulsions or suspensions of this material containing 0·25 to 0·5 per cent. DDT will kill both biting and sucking lice and are said to give control for up to three months.

Nicotine Sulphate.

This material should be used at the rate of 5 cubic millilitres (about ¼ fluid oz. or 2 teaspoonfuls) to a gallon of water. At this concentration it will kill both biting and sucking lice, but will not harm the eggs. At least two treatments, therefore, are required after a 14-16 days' interval.

Arsenic.

Arsenical dipping fluids will control biting lice only. At least two treatments are necessary at an interval of 14-16 days.

Dipping.

DDT

Dipping vats containing 0·5 per cent. DDT, as recommended for cattle tick control, will eliminate both biting and sucking lice for periods up to three months.

Arsenic.

As previously mentioned, arsenical dipping fluids will control biting lice only. If nicotine sulphate is added to the dip at the rate of 1 gallon for every 900 gallons of dip, sucking lice will also be killed. At least two dippings at an interval of 14-16 days are essential for eradication.

The best time for treatment is during the autumn or early winter, thus sending the cattle into the winter free from lice. The muster should be as complete as practicable, as any lousy animals that escape treatment can readily reinfest the rest of the herd. The beneficial effects of autumn dipping may be summed up in the words of a grazier whose cattle had suffered very severe infestations for many years, but who in the autumn of last year dipped twice—that "although the winter rainfall was well below average, the cattle wintered better than ever before."

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Address your subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Veterinary Medicines.

Veterinary Medicines Registered for the period January, 1945, to December, 1947.

List No. 2 (supplementary to List No. 1 issued on 19th July, 1946), published on 6th February, 1947, in accordance with Section 6 (7) of the Veterinary Medicines Acts.

A.C.F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane.
Andrew Dryden's Remedy for Scour in Calves.
Andrew Dryden's Liquid Blister for Horses and Cattle.

Carvosso, P. H., 28 Wienholt street, Auchenflower, Brisbane.
Worm Capsules.

Dalgety & Co. Ltd., Elizabeth street, Brisbane.
Sayers Green Seal Single Strength Fluke Drench.
Sayers Green Seal Double Strength Stomach Worm and Fluke Drench.

Embelton & Co., G. P., 196 Boundary street, Brisbane.
"Empress" Vitaminised Oil.

Harveyson, T. C., Dorrington drive, Ashgrove, Brisbane.
"Hypoloid" "Piroparv."

Leggo & Co. Pty. Ltd., A Victor, 185 Mary street, Brisbane.
"Vallo" Nicotine Sulphate.

Maclean Pty. Ltd., D., Charlotte street, Brisbane.
Baxter's Kidney & Bladder Tablets.
Baxter's Skin & Blood Pills.
Baxter's Stomach and Bile Pills.
Judge's Physic Balls.
Judge's Bot Bombs.
Judge's Colic & Gripe Drench.

McDonald & Co., A. H., 99-103 Mary street, Brisbane.
Vetamac Vaginitis Powder.

Morden Laboratories, 66 Charlotte street, Brisbane.
Morden Vitopet Tablets for Dogs and Cats.

Nicholas Pty. Ltd., 70-72 Eagle street, Brisbane.
Vetemul "A."
Vetemul "A" & "D3."
Sulpha-G.

Norris Agencies Pty. Ltd., 639 Ann street, Brisbane.
C.N. Disinfectant.
Sidolia Germicide.

Pilcher & Clarry Pty. Ltd., 329 Adelaide street, Brisbane.
Evans Ear Canker Ointment for Dogs.
Evans Veterinary Ringworm Ointment for Horses and Cattle.
Evans Worm Capsules for Small Toy Dogs and Puppies under 8 weeks old.

Poultry Farmers' Co-op. Society Ltd., Roma street, Brisbane.
"Red Comb" Worm Killer
"Red Comb" Roup Powder
"Red Comb" Eye Roup Treatment.

Queensland Pastoral Supplies Pty. Ltd., Bowen street, Brisbane.
Hart's Immunol Concentrated Bluestone and Nicotine Sulphate Drench.
Hart's Immunol Carbon Tetrachloride Fluke & Worm Drench —Single Strength.
Hart's Immunol Carbon Tetrachloride Fluke and Worm Drench—Double Strength.
Hart's Immunol Sulphur Antiseptic.

Surgical Supplies Ltd., 428 Queen street, Brisbane.
Bio Bot Bombs.
Bio Blackleg Pellets.
Bio Blackleg Cords.
Stewart's Liquid Blister.
Bio Blue Lotion (Hopple Chafe).
Bio Bowel Laxative for Dogs.
Surgical Supplies Dairy Ointment.
Bio Flukure Double Strength Carbon Drench.
Bio Healing Balsam.
Bio Titbalm.
Bio Healing Ointment.
Bio Painidine.
Bio Diuretic Powders.
Bio Gastric Mixture.
Bio Cough Electuary.
Bio Mange Ointment.
Bio Puppy Worm Syrup.
Bio Roupine.
Bio Greyhound Liniment.
Bio Blister Paste.
Bio Eye Powder.
Bio Tendonol.
Bio Canker Powder.
Stewart's Constitution Balls.
Bio Mastitis Toxiculture.

Taylors Elliotts Pty. Ltd., 150-160 Charlotte street, Brisbane.
Elliotts Phenzeen Plus.
Evans Blackleg F.W.C. Vaccine (Cattle).
Elliott's Enca.

Tudor & Petty, H. G., Russell street, Toowoomba.
T. & P. Vaginitis Powder.

INDEX OF BRANDS OR TRADE NAMES.

Brand or Trade Name.	Primary Dealer.
Andrew Dryden's	A.C.F. & Shirleys Fertilizers Ltd.
Baxter's	Maclean Pty. Ltd., D.
Bio	Surgical Supplies Ltd.
"Empress"	Embelton & Co., G. P.
Elliotts	Taylors Elliotts Pty. Ltd.
Evans	Pilcher & Clarry Pty. Ltd.
Evans	Taylors Elliotts Pty. Ltd.
Hart's	Queensland Pastoral Supplies Pty. Ltd.
Hypoloid	Harveyson, T. C.
Judge's	Maclean Pty. Ltd., D.
Morden	Morden Laboratories.
"Red Comb"	Poultry Farmers' Co-op. Society Ltd.
Sayer's	Dalgety & Co. Ltd.
Sidolia	Norris Agencies Pty. Ltd.
Stewart's	Surgical Supplies Ltd.
T. & P.	Tudor & Petty, H. G.
"Vallo"	Leggo & Co. Pty. Ltd., A. Victor
Vetamac	McDonald & Co., A. H.

F. B. COLEMAN,
Registrar of Veterinary Medicines.
Brisbane, 6th February, 1947.

QUEENSLAND SHOW DATES FOR 1947.

April.

Chinchilla	1st and 2nd
Miles	9th and 10th

May.

Kingaroy	1st, 2nd, and 3rd
Mount Perry	3rd
Marburg	3rd
Goondiwindi	3rd and 5th
Eidsvold	5th and 6th
Taroom	5th, 6th, and 7th
Yarraman	5th and 6th
Monto	7th and 8th
Roma	7th and 8th
Nanango	8th, 9th, and 10th
Beaudesert	7th, 8th, 9th, and 10th
Blackall	13th and 14th
Kilkivan	16th and 17th
Ipswich	13th to 16th
Wondai	15th, 16th, and 17th
Charleville	21st and 22nd
Gayndah	21st and 22nd
Murgon	22nd, 23rd, and 24th
Esk	22nd, 23rd, and 24th
Warrilview	23rd
Goomeri	27th and 28th
Biggenden	29th and 30th
Gympie	29th, 30th, and 31st
Kalbar	30th
Blackbutt	30th and 31st

June.

Maryborough	5th, 6th, and 7th
Boonah	6th and 7th
Childers	9th and 10th
Gladstone	16th and 17th
Bundaberg	12th, 13th, and 14th
Lowood	13th, 14th, and 16th
Gin Gin	16th and 17th
Rockhampton	18th to 21st
Toogoolawah	20th and 21st
Mackay	24th, 25th, and 26th
Proserpine	27th and 28th

July.

Charters Towers	1st, 2nd, and 3rd
Kilcoy	3rd and 4th
Ayr	4th and 5th
Townsville	8th, 9th, and 10th
Rosewood	11th and 12th
Nambour	17th, 18th, and 19th
Gatton	18th and 19th
Cairns	22nd, 23rd, and 24th
Crow's Nest	30th and 31st
Laidley	25th and 26th
Innisfail	31st, and 1st and 2nd Aug.

August.

Lawnton	2nd
R.N.A., Brisbane	9th to 16th

September.

Rocklea	13th
Beenleigh	19th and 20th

GENERAL NOTES

The Brisbane Milk Board.

An Order in Council has been issued under *The Milk Supply Act* of 1938 constituting the fourth Brisbane Milk Board for the period from 1st February, 1947, to 31st January, 1950.

Mr. E. H. Lindsey, Officer in Charge of the Commonwealth Prices Branch, has been re-appointed Chairman of the Board. Messrs. R. L. Harrison (Gleneagle), J. N. Scott (Camp Mountain), and A. C. Vores (Brisbane) are the elected representatives of the milk producers; and Messrs. G. Andrew (Petrie Terrace), A. E. Jameson (Windsor), and T. F. Plunkett, M.L.A. (Beaudesert), are the representatives of the wholesale vendors.

The Queensland Dairymen's State Council Regulations.

The Dairymen's State and District Council Regulations of 1946 issued under *The Primary Producers' Organisation and Marketing Acts* have been rescinded, and new Regulations to be known as *The Queensland Dairymen's State Council Regulations* have been issued in lieu thereof.

These Regulations give effect to the objects, powers and functions of the Queensland Dairymen's Organisation of which components are the Queensland Dairymen's State Council, District Dairymen's Councils, and Local Dairymen's Committees.

Provision is made for the making each year by the Queensland Dairymen's State Council of a levy to provide funds for administrative purposes. The amount of the levy for the year ending 30th June, 1947, is 16s. in respect of each producer.

The Regulations also provide for the election of members of district dairymen's councils, the election of the chairman and vice-chairman of each council, and election of the president and vice-president of the Queensland Dairymen's State Council.

Standing Orders for the conduct of business at meetings of the Queensland Dairymen's State Council, the District Dairymen's Councils, and the Local Dairymen's Committees are outlined.

Provision also is made for the holding of annual conferences of dairymen in the various districts of the State.

An Order in Council under *The Primary Producers' Organisation and Marketing Acts* empowering the Queensland Dairymen's State Council to engage staff and employ agents as necessary for the carrying out of the objects of the organisation has been approved.

The Veterinary Surgeons Board.

Appointments to membership of the Veterinary Surgeons Board of Queensland for a period of three years, as from the 28th February, are:—

Mr. E. F. E. Sunners (Deputy Controller of Meat Supplies), Dr. J. Legg (Acting Director, Division of Animal Industry, Department of Agriculture and Stock), (Government Representatives);

Messrs. J. C. J. Maunder (Acting Chief Inspector of Stock, Department of Agriculture and Stock), and K. M. Lucas (Veterinary Surgeon, Kitchener Road, Ascot).

Mr. R. P. M. Short, Under Secretary of the Department of Agriculture and Stock, is Chairman of the Board.

Rural Topics

Rear View.

Here is a good tip discovered by accident. A farmer of Wisconsin installed a rear view mirror on his tractor when he was travelling on the highway to town. He did not remove the mirror from the tractor, and when next ploughing found that there was no need to turn round and watch the furrows.

Bloat in Cows—Some Common Causes.

Bloat, or hoven, in cows is caused by succulent foods eaten under certain conditions, which cause the formation of large quantities of gas in the rumen or paunch, and in consequence a swelling of the left flank. It is more often seen—

When cattle are turned hungry on to such succulent green food as lucerne, clover and trefoil. When cattle accustomed to dry feed are suddenly changed on to soft green food. When travelling cattle are allowed free access to large amounts of green food such as variegated thistle. When cattle gorge themselves on wet grasses or herbage. When cattle are fed on some roots or potatoes under certain conditions, chiefly in the raw state, or should they become stuck in the gullet.

Such poisonous plants as hemlock and deadly nightshade may cause acute hoven. Again, hoven may be often seen in cattle where rumination has ceased, as in dry bible. Some cattle seem to be more subject to hoven than others.

Every effort should be made to prevent the occurrence of hoven in stock by guarding against the predisposing causes. In feeding lucerne, clovers or trefoils, if the animals are not used to such fodders they should be put on to them gradually until they become accustomed to them. If lucerne is fed when wet, especially after heavy rain (when it is soft and juicy), it will almost always cause trouble, and cattle should, therefore, be kept off it until it is drier.

Driving animals which have been feeding on these succulent foods should be avoided.

In all acute cases of bloat, no matter what form of treatment is adopted, it should not be delayed, as the animal's life will depend on the quick removal of the gases.

Value of Goats' Milk.

The milk of the goat is highly nutritious and, although the flavour is slightly different from that of cows' milk, it is frequently difficult to detect this difference if the goats are properly fed. All milk undergoes a process of curdling in the stomach; with cows' milk the curd is large, hard and tough, while the curd of goats' milk is small, light and flocculent, so that digestion is greatly facilitated. Goats' milk has a high butterfat content—approximately 5 per cent. The fat globules are much smaller than in cows' milk and do not rise readily to the top of the milk in a distinct layer, but the fat is readily separated by the ordinary separator.

The butter made from goats' milk is white, though otherwise of the same appearance and taste as butter made from cows' milk and, when artificially coloured, is indistinguishable from it. Goats' milk is also very suitable for making cheese, and is used very largely for this purpose in Switzerland.

The value of goats' milk for feeding infants and children is well known and its use is strongly recommended by the medical profession for this purpose. Goats' milk is said to be digested in the human stomach in twenty minutes, this being due to the fine curd and the fact that the small fat globules are easily assimilated. For ordinary use goats' milk can be taken fresh and in its raw state, with every confidence in its purity and high nutritive value. Tuberculosis in the goat is almost unknown, especially in Queensland, and there is no record in this State of undulant fever being contracted from goats' milk.

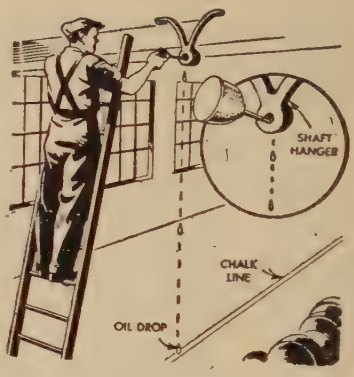
GADGETS AND WRINKLES

ALIGNING RELATIVE POSITIONS ON ROOF AND FLOOR.

This is a very novel and useful idea for occasions when it is necessary to judge the exact relative positions of objects on roof and floor.

For instance, to adjust overhead shaft-hangers to the relative position of any machine which may be set on the floor beneath them, draw a chalk line on the floor to indicate the desired location of the shafting and then drop oil from the hanger to determine when it is in proper alignment.

If there is no air current to deflect the drops, this method is very accurate and can be used for quite a number of other occasions when relative positions on roof and floor are required.

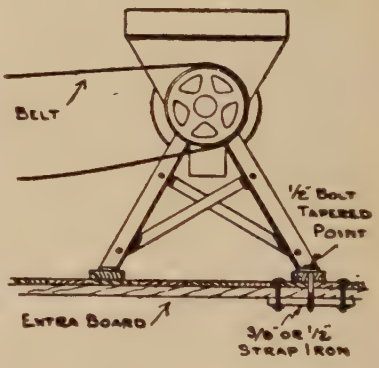


ANCHORING A FEED GRINDER.

Nail an extra board lengthwise of the joints underneath the floor, and under it bolt a piece of ⅜ in. strap iron. Tap it to take a ½ in. bolt tapered at the point so that it will centre itself in the hole.

In this way, you can line up the hole in the grinder support with the one in the floor.

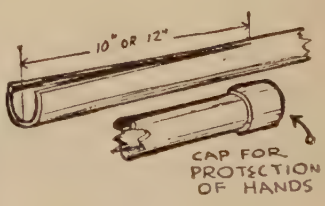
Drop the tapered bolt into the hole and screw it down. You can do this without having to crawl under the barn to screw nuts on to the bolts.



A HOME-MADE BLASTING TOOL.

This is a tool made by one farmer with satisfactory results. It is made from a piece of 1¼ in. pipe and it was found very effective for digging holes under stumps for blasting powder.

Take a piece of pipe not over 1¼ in. inside dia. and split it back on one side with a hacksaw for 10 or 12 inches, then spread the split edges apart. The pipe used in this instance was 5½ ft. long and was found excellent for getting holes under stumps where the roots were too close together to dig between them with a larger tool. The other end of the pipe should have a coupling on it to protect one's hands, or gloves.



The items on this page have been extracted from "Handy Farm and Home Devices and How to Make Them," a recent notable work by J. V. Bartlett published in Adelaide on behalf of the War Blinded Association.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

YOUR CHILD'S PLAYTHINGS.

ILL-HEALTH of emotional origin was the subject of last month's talk, and parents were advised that for all children a play area and suitable play equipment must be provided. However small the home, it is important that some space indoors or out or under the home be given over to the children so that they can play happily and undisturbed. By playing alone without the interference of grown ups, the child learns to make his own choices and his own decisions; he learns to concentrate his attention on what he is doing; he learns some of his first lessons in independence. All this is most important to his development. A little child will do the same thing over and over without tiring. Like all of us he needs to practice if he is going to do things well. Give him ample opportunity to practice pushing, climbing, balancing, hammering and singing. Try not to interfere in these activities. If he seems to be doing something awkwardly, do not try to do it for him. Let him learn that success only comes by trying and failing and trying again.

A play pen or a fenced-in part of verandah or yard is a great help to a busy mother with a one to two-year old child. If it is built with a floor which can be covered with a blanket in the cooler weather, baby will escape the draughts that sometimes make play on the room floor uncomfortable. For the pen or play space, toys will be necessary. There are two kinds of toys—those which the child can do something with, and those he can only watch. Make sure that your child has the first kind—he will so soon become tired of the ordinary mechanical toys which he can only watch. Many a child takes more pleasure in a dozen clothes pegs and a few pieces of material to wrap around them than in an elaborate ready-made doll whose clothes will not come off. The little child is interested in making, in building, and in doing. Encourage this because the world today is in great need of do-ers and you do not wish him to develop into the kind of person who is only a looker-on.

Blocks should be part of every child's play equipment. Plain and coloured ones, large ones and small—all blocks are worthwhile toys. They can be used in so many ways—to build houses, trucks and railway trains, and lots of other things too. They can be made at home by father or mother—or better still, both together. Balls are also very satisfactory toys for young children, and large sheets of paper and chalks for drawings; clay or sand or ordinary bread dough, coloured, for modelling all help to keep the children happy and interested through their creative instinct. Toys that can be pushed or pulled by a string such as a truck or wheel-barrow are of special interest to the 2 to 4 year old if they are large enough to be loaded with blocks or sand and unloaded again.

Certain pieces of play apparatus for the back yard such as a sand box and a low swing or a slide help to develop the children's muscles. Toys need not be expensive. Send your "play problems" to the *Sister in Charge, Correspondence Section, Maternal & Child Welfare, Box 634J, G.P.O., Brisbane,* and advice regarding the choice of toys and, if possible, how to make some at home will be sent to you.

Any further information on this or any other matter concerning Maternal and Child Welfare may be obtained by communicating personally with *The Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

IN THE FARM KITCHEN.

Seasonable Soups.

Haricot Bean Soup.

Soak 4 oz. haricot beans overnight, then place them in a casserole dish with enough stock or water to cover. Cover with a tight-fitting lid and cook until tender. Turn into a saucepan with 1 lb. sliced tomatoes, 2 minced onions, 3 or 4 stalks of chopped celery. Add more stock to more than cover vegetables and simmer until vegetables are tender. Rub through a sieve and keep hot. Melt 1 dessertspoon butter in a saucepan, add 1 dessertspoon flour; cook a little, add puree, and stir until it thickens, then add hot milk to the required thickness. Season with pepper, salt, a little grated nutmeg, and serve with fried croutons.

Mulligatawny Soup.

Place 1½ quarts stock (chicken for preference) in a saucepan with 1 cup chopped apple, 3 tablespoons chopped carrot, 1 cup minced onion, 2 cups water, and, if liked, 1 or 2 cloves and a bay-leaf or a tiny sprig of fresh thyme. Simmer for about 45 minutes, then rub through a sieve. In the meantime melt 2 tablespoons butter or bacon fat in a saucepan, add 2 tablespoons flour, 2 level teaspoons curry powder, cook a little, stirring all the time; then add stock and stir until boiling point. Simmer for another 10 minutes, then add the juice of a small lemon (about ¼ cup). Serve with a little well-boiled rice.

Potato and Cheese Soup.

Take 1½ lb. potatoes, 2 oz. grated cheese, 1 small onion, 1 oz. butter, 1 quart vegetable stock, ½ pint milk, 1 carrot seasoning. Peel the vegetables and cut into small pieces. Fry the onion and carrot for a minute or two in the butter, taking care not to let them colour. Add the potatoes, seasoning, and the stock. Bring to the boil and allow to simmer with a lid on until the vegetables are soft. Whisk up the soup until smooth or put through a wire sieve. Add the milk and, if necessary, some more stock or water. Heat up the soup—do not reboil. Put into a hot tureen or individual cups and sprinkle the grated cheese on top.

Cottage Broth.

Remove fat from 1 lb. scrag end of mutton and cut meat into small dice. Cut the following into dice also: 1 carrot, 2 onions, 1 swede turnip, 2 sticks celery, 1 parsnip, and 1 small potato. Melt 1 tablespoon good dripping in a saucepan, add meat and bones, and fry until brown, add 4 oz. well-washed rice and fry a few minutes longer. Add vegetables, salt and pepper, and 1 teaspoon sugar, and fry for a few more minutes. Add 5 pints stock or water and bring to boil slowly. Simmer for 2½ hours; remove bones and skim off fat, add 2 teaspoons finely-chopped parsley, and serve piping hot.

Mutton Broth.

Cut meat off bones from 1 lb. scrag end of mutton, remove fat and cut meat into dice, then cut up bones. Put them into a large saucepan with 3 quarts water and 4 oz. well-washed barley. Bring to boil and simmer for 1 hour, skimming it well during the cooking. Now add 2 carrots, 2 sticks celery, 2 turnips, cut into dice. Simmer for 1 hour longer, then remove bones. Remove fat, add a little finely-chopped parsley, pepper and salt to taste. Serve piping hot. It is a good idea to cook 3 or 4 mutton shanks in the soup, and these can be served separately with onion, caper or parsley sauce.

QUEENSLAND WEATHER IN FEBRUARY.

Seasonal rains were urgently needed over most of the State at the beginning of February as, apart from the flood totals in the south-east Downs and southern half of the Moreton district at the end of January, rainfall distribution over the greater part of the State had been mostly poor and well below requirements for several months. With the commencement of unsettled weather at the beginning of February good rains were distributed over most of Queensland, reaching heavy flood totals in all coastal districts from the North Coast Herbert south to the border by the middle of the month. At the end of February another flood rain depression was operating over the Port Curtis and Moreton subdivisions. The Peninsula, South and North Coast Barron district rains were slightly under average. A normal average in the Upper West was made up of patchy light to useful amounts, and somewhat similar conditions applied to the Carpentaria. To ensure reasonable wintering conditions, above normal rainfall is required during March and early April in these districts. Average aggregate rains of 3 to 7 inches with heavier local amounts spread over most of the Central and sub-tropical interior. These delayed but opportune falls, the best for years in the South-west drought areas, should do much to revive inland pastoral prospects, especially if additional soaking falls are received during March and April.

The Burdekin River system showed rises in the first few days of the month and, with peak periods about the 6th and 12th, maintained an appreciable run-off until after the 22nd. Flood waters were over the Inkerman Bridge from 5th to 18th, with the highest recording at 14 feet 3 inches over the rails on 12th. This indicates a higher flood than 1944 or 1945, but below the record of 24 feet 10 inches on 4th March, 1946. The Fitzroy River system showed rises on the northern headwaters on 5th, extending generally over the basin with peak flood heights of over 35 feet on 16th at Baralaba and Boolburra (Dawson River) and in the main stream at Riverslea 51 feet 9 inches (17th), and Rockhampton 17 feet 4 inches on 19th. Run-off was still maintained in the last week of the month. The above river heights are the highest for the Fitzroy since 1943. The Mary, Burnett, and upper reaches of the Brisbane River were at reporting levels from 13th to 16th. Such rises in the Burnett River had not occurred since 1942, and the river reached moderate flood heights of 21 feet 9 inches at Gayndah and 15 feet 6 inches at Bundaberg. Local flooding in the Brisbane River system was accompanied by moderate rises reported from Woodford, Murrumba, Gatton, and Rosewood. Mary River peak heights were Gympie 45 feet 6 inches (14th), Miva 43 feet 6 inches (13th), Tiaro 44 feet 4 inches (13th), and Maryborough 16 feet 9 inches (14th), heights at the last three stations being the highest since 1937. A second heavy flood rain spell commenced in the south coastal districts on the 28th, continuing till the 2nd and 3rd March. Carpentaria streams, e.g., the Flinders River, were moderately high from 6th to 12th. The Condamine River system was above normal levels for practically the whole month, and a local peak height at Roma (Bungil Creek) 23 feet (14th) equalled the highest on record. Similarly, south-western streams which rose after the 8th to peaks about 15th/19th maintained a slow run-off, with local rises passing downstream at intervals from further rain towards the end of the month.

Apart from the general main stream rises, there was much local flooding of low-lying areas, especially in coastal districts. Some loss of life was reported, and much damage to property, roads, railbeds, bridges, was caused in many districts, as well as the usual soil erosion from water-logged country.

Temperatures.—An exceptionally cool month, especially as regards maximum readings, mostly 4 deg. to 7 deg. below normal, ranging from 0.9 deg. below at Palmerville to 10.8 deg. below at Longreach, where the highest daily reading of 96 deg. was lower than the monthly mean. Minimum readings ranged from 1.8 deg. above normal at Palmerville to 1.8 deg. below at Thargomindah (Boulia 8 days over 100 deg. and Camooweal 10 days (107 deg. on 15th)).

Brisbane.—Pressure $\frac{9+3}{2}$ 29.955 inches (normal 29.903 inches). Temperatures.—Mean maximum 80.5 deg. (normal 84.4 deg.), second lowest on record (79.8 deg., February, 1893). Mean minimum 68.7 deg. (normal 68.6 deg.). Mean temperature 74.6 deg. (normal 76.6 deg.). Highest daily 85.9 deg. (19th), the lowest daily extreme maximum on record, February. Lowest daily 65.0 deg. (13th). Rainfall.—977 points on 22 days (average 624 on 13 days). Highest daily fall 504 points. Sunshine.—129 hours (normal 205.3), lowest since 124.4 in 1928. Wind gust.—South-east 45 m.p.h. (13th).

The rainfall position is summarised below—

Division.	Normal Mean.	Mean February, 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	1,308	1,800	38 above
Peninsula South	896	815	9 below
Lower Carpentaria	617	680	10 above
Upper Carpentaria	556	756	36 ,,
North Coast Barron	1,288	1,202	14 below
North Coast Herbert	1,477	3,199	117 above
Central Coast East	792	2,644	234 ,,
Central Coast West	475	1,845	288 ,,
Central Highlands	351	672	91 ,,
Central Lowlands	310	510	64 ,,
Upper Western	304	313	3 ,,
Lower Western	195	394	102 ,,
South Coast Port Curtis	576	1,455	153 ,,
South Coast, Moreton	658	1,230	87 ,,
Darling Downs, East	304	364	20 ,,
Darling Downs, West	233	604	159 ,,
Maranoa	282	590	109 ,,
Warrego	209	623	199 ,,
Far South-West	165	708	329 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

APRIL.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.57	5.47	Cairns	20	38	Longreach	31	39
6	6.00	5.41	Charleville ..	26	28	Quilpie	36	34
11	6.02	5.36	Cloncurry	44	56	Rockhampton ..	6	14
16	6.05	5.30	Cunnamulla ..	30	28	Roma	16	18
21	6.08	5.25	Dirranbandi ..	20	18	Townsville ..	18	33
26	6.10	5.21	Emerald	15	23	Winton	35	45
30	6.12	5.18	Hughenden ..	29	41	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	a.m.
1	3.11	1.00
2	3.55	2.06
3	4.34	3.10
4	5.09	4.13
5	5.42	5.13
6	6.14	6.12
7	6.47	7.10
8	7.22	8.07
9	7.59	9.05
10	8.40	10.01
11	9.25	10.57
12	10.14	11.50
		p.m.
13	11.06	12.40
14	..	1.26
	a.m.	
15	12.01	2.08
16	12.57	2.46
17	1.54	3.22
18	2.51	3.55
19	3.49	4.28
20	4.48	5.01
21	5.49	5.36
22	6.53	6.15
23	7.59	6.58
24	9.08	7.48
25	10.16	8.44
26	11.21	9.47
	p.m.	
27	12.19	10.52
28	1.11	11.58
29	1.56	..
		a.m.
30	2.35	1.03

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27 ; Cunnamulla 29 ; Dirranbandi 19 ;
Quilpie 35 ; Roma 17 ; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	12	28	27	43	2	19	30	52
6	21	18	38	34	12	9	43	38
11	30	10	45	25	20	0	53	28
16	27	13	43	28	18	3	50	31
21	16	23	32	39	8	14	36	45
26	10	30	25	44	0	20	27	53
30	14	25	30	41	5	16	34	48

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS)

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	50	37	63	22	49	9	42
3	20	41	43	58	28	44	17	35
5	30	31	51	53	35	37	25	27
7	40	21	57	44	42	29	33	18
9	48	11	63	38	48	23	40	11
11	54	5	67	34	51	20	44	6
13	53	4	67	33	50	19	44	5
15	48	8	63	36	48	21	40	8
17	43	16	60	41	45	26	36	15
19	34	26	54	47	38	33	29	22
21	23	38	46	56	30	41	20	33
23	13	47	39	62	24	47	12	39
25	6	53	35	66	20	51	6	44
27	6	51	35	64	20	50	6	43
30	18	43	42	59	27	45	16	36

Phases of the Moon.—Full Moon, April 6th, 1.28 a.m., Last Quarter, April 14th, 12.23 a.m. New Moon, April 21st, 2.19 p.m., First Quarter, April 28th, 8.18 a.m.

On April 16th the Sun will rise and set 10 degrees north of true east and true west respectively and on April 5th and 20th the Moon will rise at true east.

Mercury.—Will be a morning object all this month, reaching greatest angle west of the Sun on April 5th when it will rise a little more than 2 hours before the Sun. It will then be between Venus and Mars; Mars being the faintest of the three and closest to the horizon. At the end of the month Mercury will rise about 1 hour 15 minutes before the Sun and Mars will then be situated between Mercury and Venus.

Venus.—On the 1st, in the Constellation of Aquarius will rise nearly 3 hours before the Sun and will still be a conspicuous object in the Eastern Morning sky. On the 30th, in the constellation of Pisces, it will rise about 2½ hours before the Sun.

Mars.—In the Constellation of Pisces may now be seen low in the east during morning twilight. On the 1st it will rise about 1 hour 25 minutes before the Sun, and on the 30th will rise about 2 hours before sunrise and will then be seen between Mercury and Venus.

Jupiter.—In the Constellation of Libra will be well placed for observation all this month. At the beginning of April will rise between 8 p.m. and 9.15 p.m. and at the end of the month will rise a few minutes before sunset.

Saturn.—Will rise during mid-afternoon at the beginning of this month and about noon at the end of the month. It will set about 1 hour after midnight on the 1st and about 1 hour before midnight on the 30th.

Star Charts.—The chart on the right is for 8.15 p.m. in the South-East corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th April. (For every degree of Longitude we go west, time increases 4 minutes.) The chart on the left is for 8 hours later. On each Chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing North hold N at the bottom; when facing South hold S at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, in the beginning of the month, the stars will be in the positions shown, about one hour later than the time stated for the 15th and at the end of the month about one hour earlier than that time. The positions of the moon and planets which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

FEBRUARY RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.,	No. of years' records.	Feb., 1946.	Feb., 1947.		Feb.,	No. of years' records.	Feb., 1946,	Feb., 1947.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	11·44	42	14·56	12·39	Gatton College ..	3·52	44	6·34	..
Cairns	16·30	61	20·61	14·29	Gayndah	4·20	72	1·30	8·22
Cardwell	17·00	71	20·02	52·38	Gympie	6·58	73	4·73	15·92
Cooktown	13·71	67	17·57	11·03	Kilkivan	4·91	62	6·20	11·61
Herberton	8·63	57	11·37	7·73	Maryborough ..	6·65	72	2·24	13·96
Ingham	17·12	51	18·16	22·52	Nambour	9·57	47	8·36	25·39
Innisfail	23·07	62	33·43	32·81	Nanango	3·93	61	3·28	5·82
Mossman	20·86	19	22·04	13·44	Rockhampton ..	7·74	72	2·87	11·05
Townsville	11·33	72	18·75	28·60	Woodford	8·05	55	5·95	17·64
Central Coast.					*Darling Downs.*				
Ayr	9·62	56	11·99	66·17	Dalby	2·85	73	2·42	2·69
Bowen	8·96	72	10·22	37.30	Emu Vale	2·59	47	1·87	1·80
Charters Towers ..	4·63	61	7·45	14·29	Jimbour	2·75	64	3·00	2·35
Mackay	12·41	72	4·42	31·15	Miles	2·72	58	2·03	3·06
Proserpine	13·85	40	9·71	43·97	Stanthorpe	3·18	70	1·41	3·65
St. Lawrence ..	7·67	72	4·49	13·55	Toowoomba	4·53	71	5·54	9·32
					Warwick	3·10	78	2·75	2·45
South Coast.					*Maranoa.*				
Biggenden	4·18	44	1·40	9·46	Roma	2·87	69	0·20	6·46
Bundaberg	6·39	60	1·30	22·62	St. George	2·39	62	0·84	5·49
Brisbane Bureau ..	6·24	95	7·32	9·77					
Caboolture	7·82	67	5·89	15·44	*Central Highlands.*				
Childers	6·42	48	2·25	21·33	Clermont	4·27	72	3·30	4·45
Crohamhurst	12·48	50	8·19	27·30	Springsure	3·78	74	1·54	6·38
Esk	5·24	56	4·80	6·43					

CLIMATOLOGICAL DATA FOR FEBRUARY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	89	74	94	2, 15	70	5	1,429	19
Herberton	..	82	66	90	1, 2	60	20	773	17
Townsville	..	87	74	95	14, 15,	68	1	2,860	17
Rockhampton	29·86	84	71	92	14	68	24	1,105	18
Brisbane	29·98	81	69	86	19	65	13	977	22
Darling Downs.									
Dalby	..	83	65	92	19	59	17	279	7
Stanthorpe	..	75	59	86	19	50	17	365	18
Toowoomba	..	74	61	89	19	53	17	932	18
Mid-Interior.									
Georgetown	29·78	90	73	95	15, 20	68	21	530	8
Longreach	29·82	86	71	96	1	57	2	622	12
Mitchell	29·85	84	70	93	7, 8	64	25, 26	731	12
Western.									
Burketown	..	92	76	97	14, 16, 24	70	27	1,205	15
Boulia	29·73	94	74	105	1	68	11, 27, 28	362	10
Thargomindah	29·81	88	72	101	9	60	10	638	12

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Commonwealth of Australia,
Meteorological Bureau, Brisbane.